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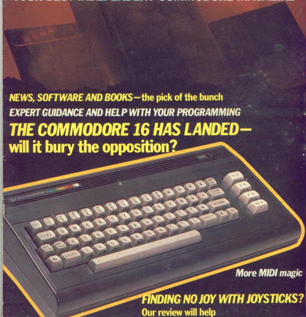
DECEMBER 1984
80p

NEW

Your COMMODORE

YOUR BEST INDEPENDENT COMMODORE MAGAZINE



NEWS, SOFTWARE AND BOOKS—the pick of the bunch

EXPERT GUIDANCE AND HELP WITH YOUR PROGRAMMING

THE COMMODORE 16 HAS LANDED—will it bury the opposition?

More MIDI magic

FINDING NO JOY WITH JOYSTICKS? Our review will help

commodore
64

Alice IN VIDEOLAND

NOW ON CASSETTE!

PURE MAGIC!

Join Alice in her journey through Videoland - an enchanted place populated by strange creatures such as bread-and-butterflies and pipe smoking caterpillars; where little girls change size and flamingos turn into croquet mallets!

Alice in Videoland is a revolutionary new concept in entertainment for the Commodore 64, incorporating some of the finest graphics ever seen on any home computer, accompanied by a charming musical score. There are four different game scenes involved, and your performance in earlier ones will affect your ability to get through later ones and determine your eventual total score.

Scene One - Stunning title page graphics give way to the first game scene as Alice falls into the rabbit's warren. Score points for collecting the objects to be found there - including keys to open doors, bottles to make her smaller, cakes to make her bigger!

Scene Two - Out in the garden the Cheshire cat looks on as Alice meets the pipe-smoking caterpillar. Help her to catch the bread-and-butterflies and the rocking-horse flies that change into the balls used in the croquet game in the last scene!

Scene Three - Alice is a pawn in the chess game where her opponents are the Jabberwocky and Tweedledum and Tweedledee. Help her across the board by protecting her with your White Knights!

Scene Four -The most bizarre croquet game ever! Help Alice hit the balls through the playing-card-soldier hoops before the Queen of Hearts stomps on them!

Alice in Videoland is available for the Commodore 64 on disk - £12.95, and now on cassette - £8.95.

Alice in Videoland features graphics created with the Koala Pad.

Audiogenic LTD

P.O. BOX 88, READING, BERKS.

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Our COMMENT

Your editor spares a few seconds of her precious time to introduce another issue of Your Commodore.

WELCOME TO THE THIRD issue of Your Commodore. If you've already fingered through the pages then I needn't tell you that, once again, it's jam-packed with the latest news, reviews, games, utilities, special features and much, much more. If not, then bear with me until curiosity tempts you to turn the page.

Since you last feasted your eyes upon a copy of Your Commodore, they've been working their fingers to the bone over at Commodore. Not only have the long-awaited 16 and Plus 4 machines been launched and exhibited to the world at large, but a host of new peripherals and software has also been released. How will the 16 fare in the face of growing competition? Read our article and judge for yourself. Commodore have also finally unleashed their Commodore 64 Communications Modem and CompuNet, the new on-line service for Commodore users. But you'll have to see next month's Your Commodore for the low-down on this.

Showtime

Everybody loves a show and the 7th PCW show was certainly no exception as thousands of computer moguls, journalists, games freaks and would-be programmers trudged through the corridors of Olympia 2 from 19th-23rd September. With winter already well underway and Christmas on the horizon, the time is ripe and the market ready for new releases — all too evident with the hoards of offerings from software houses up and down the country. Wares displayed included not only the new Commodore machines but a tide of software, books and peripherals such as Currah's Speech 64.

Lend me your ears

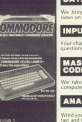
Talking of which, Your Commodore is louder this month. Gone are the days when the only hint of music emitting from the confines of your house might be Radio 1 or you enjoying your early morning bath. Your Commodore is competing in the music stakes. We bring you the second installment of our two-part MIDI series and we also hope to set your fingers tapping and your ears buzzing with a guide to two software packages — MusiCalc and Music Master — which transform your Commodore into a music synthesiser. Whoever suggested that new technology was breeding a nation of philistines?

64
SUPERSOFT
MUSIC MASTER
MusiCalc
Synthesizer & Sequencer

Reader input

But, as much as we pester software houses in pursuit of the latest releases for exposure by our reviewers, toil as we may over our trusty typewriters to bring you erudite and entertaining articles, where would we be without you, our readers? We anxiously await your praise and criticism, your comments and ideas. Are we catering for your needs? Are there too many games — or not enough? Is the general tone too serious — or too lighthearted? We're quite amiable here — so drop us a line or give us a call. Praise or abuse us — we don't mind so long as you get your views across. Thank you to everyone who has already put pen to paper: we shall endeavour to answer all your letters.

Your comments reveal a world of frustrated VIC 20 owners. We want to fulfil your needs — but our supplies are low. So, how better to pass those long winter nights than by retiring to a warm corner and conjuring up weird and wonderful games and utilities on your VIC 20. And, of course, we don't expect you 64 'programmers extraordinaires' to be sitting idle either. Get tapping and share your genius with us humbler mortals! Send your output to the editor: you'll find the editorial address on the next page.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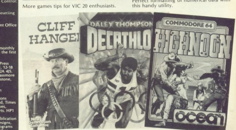

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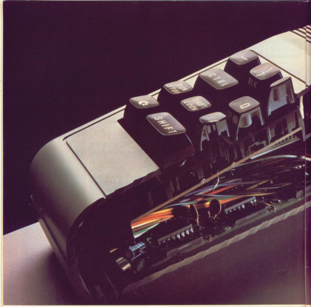


Are you only using

To play only games on a Commodore computer is like asking Albert Einstein to work out the square root of four.

The computer's brain barely ticks over.

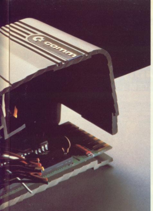
To really stretch it, you need more interesting software programs. For example, record keeping, interactive education, stimulating adventure games or word processing.

And for these you need peripherals.

Like a Commodore disk drive, a really fast storage and retrieval system with a vast memory.

Or a Commodore cassette unit, the inexpensive way of loading and storing programs.

For those who like the idea of text and graphics being more alive and having greater clarity than on a TV, there's the Commodore colour monitor.



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For Commodore 16 and
Commodore plus/4.

COMMODORE 1530 ☐
£44.95. For Commodore 64.

COMMODORE 1701 ☐
Colour monitor. £230.00.

JOYSTICKS ☐
(prices from £7.50)

PADDLES (£13.50) ☐

Details correct at time of going to press.

1/10th of your brain?

And for hard copy, there are our three printers and a printer plotter. These will preserve on paper–in colour, black and white, chart form, graphs or text, the fruits of all your labour.

Finally, to make games playing more exciting, there are joysticks and paddles.

So use your brain. And make sure you use all of your computer's brain.

FOR FURTHER INFORMATION, TICK ONE (OR MORE) OF THE BOXES ABOVE AND SEND TO THE COMMODORE INFORMATION CENTRE, 1 HUNTERS ROAD, WELDON, CORBY, NORTHAMPTON NN17 1QX. TEL: CORBY (0536) 205252.

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DATA STATEMENTS

Multiple birth at Commodore

Pride of place in this month's news from Commodore Business Machines must go to the launch of their two new machines: the Commodore 16 and the Plus/4. Howard Stanworth, General Manager of Commodore Business Machines (UK) Ltd., hopes that these two machines, along with the 64, will "...form the strongest range on the market over the Christmas period".

The Commodore 16 has been designed as a successor to the VIC-20 and will be sold in a complete starter pack at £139.99. It includes 16K RAM, a full typewriter-style keyboard, sophisticated sound capabilities, 121 colours for high-quality graphics and advanced BASIC. The starter pack contains the computer, cassette deck, Introduction to BASIC part 1 and 4 recreational software packages. (The 16 is reviewed elsewhere in this magazine).

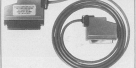
The Commodore Plus/4 is described by Mr. Stanworth as "...an affordable home computer for the more serious user". And, in an attempt to prove this point, it comes with 4 integral programs: word processing, database, spreadsheet and business graphics. But he does stress that the Plus/4 "...is not a fully-fledged business machine. It is a competitively-priced home machine ideally suited to the professional who wants to use it for productive applications". The Plus/4 contains 64K RAM, of which 60K is available to the user for BASIC programs and includes, amongst the more obvious facilities, advanced BASIC, screen window facility, a HELP key and simple cursor controls. It retails at £299.99.

Both machines are being manufactured at the new Commodore factory in Corby and should be available at the end of September.

Father Commodore also promises to stuff our Christmas stockings with other goodies. A new cassette deck, the 1531 (cost — £44.95) and a new single disc drive, the 1541 (cost — £299) should soon be available. Also in the Commodore Christmas package this year can be found two new printers compatible with the entire range of Commodore home computers. These are the MCS 801, a colour dot matrix printer, and the DPS 1101, a low-cost letter quality printer; both models will sell for £399. Both Commodore and the leading software houses are devel-oping a range of software for the 16 and the Plus/4.

Creditable interface?

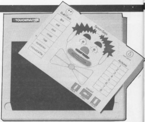
The Access Computer Company of Stockport have developed a serial interface and cable to connect most RS232 serial printers to the Com modore 64, VIC 20 or SX64 Portable. The unit, which is supplied with instructions and a 1-year guarantee, is available by Mail Order at £34.95 inc. VAT and post from Access Computer Company Ltd., The Computer Centre, 61 Shaw Heath, Stockport, Cheshire, SK3 8BH. Telephone 061-477-6013.



Show-down at Olympia

The curtain was raised and the chips were down at the end of September for the Seventh Personal Computer World Show. Amongst the companies displaying their latest wares for the 64 were Anirog, Argus Press Software, Audiogenic, Bubble Bus, Creative Sparks, Melbourne House, Protek, Currah and many more. We reveal all about the PCW Showstoppers elsewhere in this magazine.

DATA STATEMENTS



Get in touch with your 64

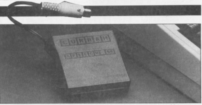
Touchmaster Ltd. have released their pressure-sensitive surface which, complete with its own microprocessor, is able to interface with a range of micro and personal computers, including the Commodore 64. Touchmaster, as the device is called, hopes to overcome resistance to keyboard usage.

The Touchmaster has an A4 working surface and a resolution of 256 x 256. The surface is fully linear across the active area and does not use any moving switches or similar devices.

The company plans to develop a catalogue of software — to be called Touchware. The first releases of software specifically designed for the Touchmaster include graphic packages, educa-tional early learning programs, board games, arcade games, adventure games and programmer utilities.

The complete package to be marketed will contain the Touchmaster, Touchware multipaint graphics program and other accessories required for immediate use with a home computer. The recommended retail price is £149.95. Touchmaster may be contacted at P.O. Box 3, Port Talbot, West Glamorgan, SA13 1WH.

Currah speaks out



New for the Commodore 64 from Currah Computer Components Ltd. comes Speech 64 which was developed in conjunction with General Instruments. It is an allophone speech synthesiser which means that it uses individual speech sounds strung together to make intelligible speech. It has an unlimited vocabulary and its makers claim it can synthesise any word or sentence in the English Language.

Speech 64 features a 'Say' command which provides text-to-speech, a high and low voice each its own intonation and integral BASIC com-mands. It is a hand-sized unit which plugs directly into the back of the Commodore; sound is generated through the T.V. receiver.

Currah's speech synthesiser retails at £29.95. Currah may be contacted at Graythorp Industrial Estate, Hartlepool, Cleveland, TS25 2DF. Telephone 0429-72996.

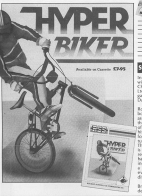
We hope to review Speech 64 in next month's issue).

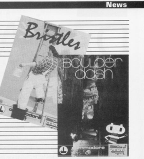
PSS hit the road

From the end of September, Commodore 64 users can get on their bikes with the latest offering from PSS. Entitled Hyper Biker, it is a high quality representation of the popular craze, BMX biking. It enables up to four players to act out sophisticated biking manoeuvres and, from a straight race, through obstacles, wheelies, long jumps, high jumps and bunny hops to compete for the accolade of BMX champ.

The bike is controlled via joystick or keyboard and track features include table top, whoop de doos, ramps, speed bumps, ditches and drop offs.

Hyper Biker is available on cassette at £7.95. PSS may be contacted at 452 Stoney Stanton Road, Coventry, CV6 5DG.





Statesoft

In the wake of their success with their CBM games, Astro Chase and Flip Flop, State Soft Ltd. have released to new games for 64 users, Boulder Dash and Bristles.

In Boulder Dash, our hero, Rockford, has to avoid crashing boulders, walls of rock and assorted creatures as he digs for the gleaming jewels. In pursuit of the diamonds, he must turn his enemies to his advantage — for example, butterflies may be turned into precious stones. The mysterious escape tunnel is revealed only once the required number of diamonds have been collected. The game includes 16 mystical caves with a playable intermission after every 4, and 5 levels of difficulty.

For all non-DIY enthusiasts, Bristles takes the pain out of decorating. The object is to paint all the rooms in a building without losing your brushes before time runs out. There are 8 different game screens and 6 skill levels for each building; your target is to paint all 8 buildings in each level. While fulfilling your task, you must avoid the Bucket Chucker, the Dumb Buckets and flying Half-Pints. Lifts and stairs are provided for your transportation — but beware the caretaker's daughter as she daubs your carefully painted walls with her hand prints! Your efforts are rewarded with prizes.

Both games are available on cassette and retail at £8.95. State Soft are at the Business & Technology Centre, Bessemer Drive, Stevenage, Hertfordshire, SG1 2DX. Telephone: 0438-316561.

Creating another Legend

Legend, creators of the 1984 Game of the Year, Valhalla, have announced details of their latest release, The Great Space Race. Scheduled for release on the Commodore 64 in late September/October, chairman John Peel describes it as a "...completely new kind of computer entertainment — one that goes beyond arcade and adventure games, but retains the best elements of both".

He certainly believes Legend's newest baby looks good. With a revolutionary operating system, MOVISOFT 2, Mr. Peel claims that "...true solid 3D graphics..." have been achieved and advanced graphics enable the characters on-screen to be seen "...in detailed close-up".

The game falls into two phases. In the pre-race section, you must compete for the best spaceships, weapons and personnel for your team. The event itself involves a race against "...time, natural obstacles and your competitors".

Using a new form of single key-press commands, The Great Space Race enables characters to offer you options based on their current situation through an 'options generator' constantly monitoring game development.

THE GREAT SPACE RACE

The Great Space Race costs £¼ million to produce which is thought to be the largest amount ever spent on the development of a single game.

Legend may be contacted at P.O. Box 435, Station Road, London E4 7LX; telephone: 01-524-8324/5.

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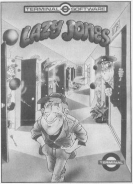


The Professionals

Audiogenic Ltd. has launched their Professional Range of business application software for the Commodore 64. The three packages in the range are a word processing system, Micro Wordcraft, a spreadsheet facility, Swift, and their database system, Magpie.

All three packages are disc-based and retail at the following prices: Wordcraft — £24.95; Swift — £19.95; Magpie — £39.95. Audio-genic Ltd. may be contacted at 39 Suttons Industrial Park, London Road, Reading, Berks RG6 1AZ. Telephone: 0734-664646.

Terminal Laziness

Terminal Software has been far from idle in developing 'Lazy Jones', their new game for the 64. There are 18 doors in all and, behind each, lies the opportunity for Lazy Jones, the most indolent hotel cleaner in the trade, to avoid work: he can play games, hide in the broom cupboard, drink in the bar or go to the toilet — anything to avoid the irate manager or the ghost of the previous manager.

'Lazy Jones' features a split-screen window and retails at £7.95. Terminal Software are at Derby House, Derby Street, Bury, BL9 0NW. Telephone: 061-761 4321.

Things that go bump in the night

Who would have thought it? David Darling (18) and his brother Richard (16) always seemed such ordinary young men but then unexpected things started happening round them. It all began at the beginning of 1981 in Canada when they acquired a VIC-20. From that moment on they found they had a talent, an unexplained power, call it what you will, which they have been attempting to harness ever since. At first it was just ordinary sprites they called up but more recently those sprites have been transforming themselves into a complete demoniacal hierarchy: ghosts, ghouls, zombies and poltergeists. The source of this power has been traced to their Commodore 64.

Surprisingly, nobody seems to be at all concerned. Rather the opposite for the Darling brothers are in fact the authors of the new game for the CBM 64 from Mastertronic called Chiller. In it you are given the task of rescuing your fair beloved from a haunted mansion whilst warding off the unwanted attentions of the afore-mentioned denizens of the underworld. And at £1.99 at least you're assured of a cheap thrill.

This energetic pair who have so far written 35 games including about a third of Mastertronic's output (see Space Walk and BMX Racer, both for the CBM 64). are also working on a games designer for the new Commodore 16. This will be their third games designer this year and follows the one they did for the VIC-20, released on the Galactic label, and the Games Creator for the CBM 64. due for imminent release from Mirrorsoft.

The C-16 version should be ready in about 2 months time and will be marketed by Commodore itself. The brothers have already been working on a C-16 for a couple of months now, so Your Commodore was obviously interested in their opinion of the machine. "In most respects it is as good as the 64 — the two disadvantages are the lack of sprites and the sound," they told us. Still, a good games designer should go a long way to relieving the first problem.

So, with all this activity it looks very unlikely that the Darling brothers will be disappearing without trace.

Mastertronic can be contacd at Park Lorne, 111 Park Road, London NW8 7JL; telephone: 01-402-3316.

Toil and trouble from Creative Sparks

Creative Sparks have announced the release of their new adventure game for the Commodore 64, Macbeth — the Computer Adventure. Based on the Bard's gruesome tragedy the game comes as two fast-loading cassettes, with a full set of instructions, plus a complete text of the play. The player can participate in four independent adventures, plus psychoanalysis sessions giving the player an insight into the aims and motivation of the leading characters. The adventures all differ from one another in style and content; each depicts a scene from Shakespeare's original play.

Creative Sparks are part of THORN EMI; David Gearing, general manager for THORN EMI Computer Software Publishing says of Macbeth "We are delighted to be publishing this ingenious package...It is full of unexpected twists and turns, rich in different meanings, alive with fresh possibilities".

Macbeth — the Computer Adventure retails at £14.95. Creative Sparks can be contacted at THORN EMI Computer Software, Thomson House, 296 Farnborough Road, Farnborough, Hants. Telephone: 0252-543333.

Art for Commodore's sake

The first prize of a £5,000 endowment and £1,5000 worth of computer equipment in the world's first competition to use home computers to create works of art, the Commodore International Art Challenge, went to Hugh Riley, a young unemployed art graduate. As a result of his winning entries in the 18+ Dynamic category, Louis (Meditation Failure 126) and Obsessiveness, Mr. Riley will be able to use the endowment to study computer art at a prestigeous educational establishment in any country of his choice and hopes, as a result of this unique opportunity, to pursue a career in computer graphics.

The award was presented by Professor Brian Allison, World President of the International Society for education through Art, at a ceremony at London's Hamilton Gallery. Professor Allison commented that "The Commodore Art Challenge has revealed a fascinating new area for art and for home computers. I am convinced this initiative and the exhibition of computer pictures are just a glimpse into a future which will see art and technology increasingly working together".

The competition was divided into Still and Dynamic entries and under 12, 12-17 and 18+ age groups: the winners in each category received £1,500 worth of Commodore equipment of his or her choice, as did Mr. Joachim Wester of Sweden with his entry, "Mr. Freakenstein', winner of the prize for the best non-UK entry.

Commodore sales boost

Commodore UK's sales topped the £100 million mark during the last financial year, thus attaining an all time record and making the company a major contributor to Commodore International's record $1.27 billion sales for the year ended 30 June. Mr. Howard Stanworth, General Manager of Commodore Business Machines (UK) Ltd., believes that "...in revenue terms..." this makes Commodore "...the undisputed leader in the British home computer market".

New face at Commodore

Rae Potter has been appointed as new Software Products Marketing Manager at Commodore UK. He expects to be "...looking particularly for software which actively exploits the full capabilities of our machines — not only the VIC-20 and Commodore 64, but also the new Commodore 16 and Plus/4 home com-puters". Mr. Potter believes that: "The mass market for software has arrived and with the imminent launch of the new Commodore 16 and Plus/4 computers, Commodore is in an unprecedented position to dominate, not only in hardware, but also in software".

Soft deal

Commodore dealers will now be providing 3 software packages with every 8296D business machine sold. These are: Superscript, a wordprocessing package including Spelling Checker; The Manager, a comprehensive database and file management package and Calc Result, a financial planning spreadsheet.

The 8296D with integral 2Mbyte floppy disc drive, 128K RAM, monitor, keyboard and the aforementioned software packages retail for £1,690 excluding VAT.

DATA STATEMENTS

CompuNet launch

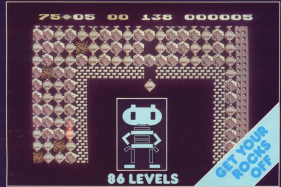
The PCW show will see the launch of the Commodore Communications Modem and their new database, service, CompuNet, initially available only to Commodore 64 users. The first year's subscription to CompuNet is free with the purchase of the Commodore Modem, which costs £99.99.

New modem

Cirkitt Holdings PLC has developed a modem which has full British Telecom approval and, so they claim, at £59.95, is less expensive than any equivalent equipment. The modem took under six months to design and bring to the market. It is to be marketed by Protek Computing Limited who have worked closely with Cirkit on its development and have produced a range of interface packs to make the modem compatible with most personal computers on the market, including the Commodore 64. Cirkit and Protek are predicting modem sales of £2 million over the next 18 months.

Cirkit Holdings PLC can be contacted at Park Lane, Broxbourne, Herts EN10 7NQ. Telephone: 0992-444111.

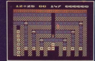
BIGGER, BOULDER, *More* BEAUTIFUL
AMERICAN NO 1.


75♦05 00 138 000005
86 LEVELS
GET YOUR ROCKS OFF

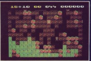
JOYSTICK

Boulder dash

commodore 64


12♦25 00 147 000000

BOULDER DASH
STAR


15♦10 00 044 000000

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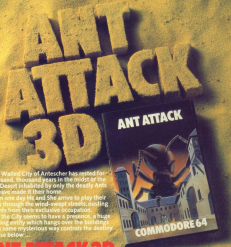
Really Something Else

They came from out of the desert to the lost city of Antescher and discovered the HORROR of the ANTS...



The Walled City of Antescher has rested for a thousand, thousand years in the midst of the Great Desert inhabited by only the deadly Ants who have made it their home.

Then one day He and She arrive to play their games through the wind-swept streets, ousting the Ants from their exclusive occupation.

But the City seems to have a presence, a huge brooding entity which hangs over the buildings and in some mysterious way controls the destiny of those below ...

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INPUT OUTPUT

Whether your forte lies in preaching or praising, asking or abusing, here's your chance to air your views or pass on any useful hints and tips to fellow Commodore users.

Dear Sir,
All those Commodore 64 users who cannot get their voice two to work, don't take the computer back to the shop. There is nothing wrong with it; the manual is wrong. On page 161 the waveform for voice two is 54283 and not 54288.

Here's another tip for you 64 users. POKE56325,X (X=1 to 255). This will speed up the cursor and is very useful when editing long lines.
Yours faithfully,
William Fong,
London.

Dear Sir,
In reply to J. Lee (Input/Output – October issue), I also have a Commodore and Brother EP22 series printer. He may find it useful to note that the interface I have found most suitable is the Stack for the VIC 20/CBM 64 ftom: Stack Computer Services Ltd., 290-298 Derby Road, Bootle, Liverpool, L20 8LN. Also, the cable he receives may be wired incorrectly:

Computer end pins
TO
Printer end pins

The most reliable commands found to date are:

To take a listing

```
OPEN 2,2,2,CHR$(2)+CHR$(0):
CMD2
LIST A-B      (Max. 60 lines)
LIST B-C      etc.
PRINT#2
CLOSE 2
CMD 3
```

To use within a program:
The OPEN statement should be used before the DIM$ statements, and programs used with the OPEN in a GOTO/GOSUB routine should have this line deleted and moved to the top of the listing ie:

```
10 PRINT "HELLO"
20 OPEN 2,2,2,CHR$(2)+CHR$
(0)
30 DIM A                  etc
```

OPEN 4,4 will not work. The interface cable and printer all work well.
Yours faithfully,
S K Thoanber,
Hull.

Dear Sir,
What a super magazine – it is magnificent! As I was browsing along the magazine shelf I noticed your magazine screaming to be looked at. After a quick look I promptly bought and raced home to look at it; as a VIC 20 owner myself I bought it to seek out new talents. The reason it is so different is because all the other Commodore magazines focus mainly on one thing: the CBM64. Most of the programs, hints, reviews and information are on this machine. I congratulate you on seeing the light for us poor VIC and PET owners. Your article entitled 'Vic Games programming' was exceptionally good.

How about including the top ten tables of software for the VIC and 64. And, how about doing reviews of Commodore's new computers, the CBM 16 and Plus 4.
Yours faithfully,
Andrew Philpott,
Hertford.

We answer,
We are delighted that Mr. Philpott, and all the other readers who showered us with praise, like our magazine. We shall endeavour to keep you happy and hope you will continue to send us your comments and bright suggestions for future articles, games, etc. Please, please inundate us with VIC 20 stuff as we're in short supply! Finally, you can find a review of the Commodore 16 elsewhere in this magazine. We hope to review the Plus 4 next month.

Dear Sir,
I have a Commodore 64 and I am very interested in becoming a member of CompuNet. I would appreciate it if you would send me details on how much it would cost to join, what would be the most suitable modem for my computer and, also, how much the modem would cost.

Could you please give me more information about how CompuNet works and, also, tell me where my nearest main Commodore supplier is.
Yours faithfully,
Steve Paterson,
Livingston, Scotland.

We answer,
The only modem suitable for use with CompuNet is Commodore's own Modem which retails at £99.95. On purchase of this modem you're entitled to one year's free membership of CompuNet (worth £30). For information on how CompuNet works, see the review in our next (January) issue. The modem is only available, at the time of going to press, directly from Commodore Business Machines (UK) Ltd. at 1 Hunters Road, Corby, Northants. The nearest main Commodore supplier to Mr. Patterson in Livingston is Peritronic Ltd. at Lomand House, Almond Vale, Livingston, West Lothian. Telephone: 0506-410041.

Dear Sir,
I have recently bought a Commodore MPS 801 pripter for use with my 64 and, as well as the standard 11 by 9.5 inch paper for the printer I have also acquired for free 2000 sheets of 7.5 inch paper. I should like to use this narrower paper for program listings but, when doing this, the longer program lines are printed off the edge of the paper. I would like to know if there is any way of making the printer print shorter lines when using the list command as this would save me a lot of money buying expensive printer paper.

Congratulations on your first edition of one of the best magazines for the Commodore user.
Yours faithfully,
W.L. Williams,
Dyfed.

We answer,
Can any of our readers answer Mr. Williams' 'cri de coeur'?

Dear Sir,
I own a Commodore 64 and have recently bought the 'PETSPEED' compiler. This gingers up some of my ordinary BASIC programs but I cannot make it work on even the simplest High-Res program such as those to clear the screen and draw a circle. My BASIC program is taken straight out of the 'Programmer's Reference Guide' (pages 122-123 and 126-127) and runs perfectly (though appallingly slowly). I have added a very simple machine code program which clears the screen and puts it into High-Res instantaneously, but of course thereafter the drawing is as slow as ever. The PETSPEED will not run this either; but, if I include a command in the PETSPEED program to load the machine code program from disc, the screen does clear – and nothing else happens. It refuses to carry on drawing the figure and the screen remains blank until I hit RUN/STOP RESTORE. In every case, the compiling seems to be error-free, but the result doesn't run.

The base for the 'bit-map' memory is 8192. Since the compiled program seems to occupy about 8450 bytes (most of which is, I believe, the PETSPEED interpreter), I have tried altering the base to 10240 or even beyond, so as not to interfere. The effects of this are, firstly, that only the lower two thirds of the screen are cleared and the top third after the final 'paint' is covered in vertical bars; and, secondly, although the circle gets drawn, its centre is very much displaced (though this can be remedied by changing two constants in the program). This program compiles alright too, but won't run either (in the compiled version).

I attach copies of the two programs. As you can see, they are very short and simple.

Can you offer any advice? Where am I going wrong? And where can I find some literature more explicit and less superficial than the 'Reference Guide'?
Yours faithfully,
M.W. Peters,
Dorset.

We answer,

Try putting the high-res screen down to 32768 and paging the VIC II chip to look at the third 16K block of RAM. Currently, your high-res screen is corrupting your program.

See our guides (in this issue and in previous issues of 'Your Commodore') to the vast output of literature available for Commodore users.

A.P. and D.J. Stephenson explore Instructions and Addressing modes in the third part of this series on machine code.

MASTERING MACHINE CODE

ONE COMPLETE ORDER TO the microprocessor is called an instruction. The 6510A has a repertoire, called the *Instruction Set*, of almost 60 different types but, because most of them are available in several different forms, the total number of permutations rises to several hundred. Such a huge number to choose from can be frightening to the newcomer. Because of this, we feel that presenting the full repertoire at this stage would be more confusing than helpful. Fortunately, only a relatively small proportion of the total number are in regular use. In fact, it is possible to begin writing workable machine code programs by restricting the repertoire to twenty or so instructions.

The instruction format

A machine code instruction represents *one complete order* to the microprocessor and normally consists of two distinct parts as shown in Figure 3.1

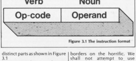

Figure 3.1 The instruction format

As in everyday speech, any order given to a person consists of two parts, the *verb* (what particular action is required) and the *noun* (which particular object is to receive the action). For example, suppose we instruct someone to 'kick'. The person is confused because, although he knows how to kick, he has not been told which particular individual or object requires kicking. In other words, the instruction has a verb but no noun so is incomplete. There are normally two parts of a machine code instruction, the *operation code* and the *operand*.

The operation code

This corresponds to the verb because it tells the microprocessor what particular action is required. In general, the op-code can be a decimal number, a pair of hex digits or, if you have an assembler, a three-letter group known as an instruction *mnemonic*. Every instruction has a unique code number. Unless you have additional software aids, the only way to enter an op-code on the Commodore 64 is by POKing a decimal number. This is an awful method because decimals and machine code are alien to each other. Machine code programming is not the easiest of subjects and if we have to work entirely in decimal op-codes, the task borders on the horrific. We shall not attempt to use decimal op-codes at all. As mentioned in Part 1 of this series, if you intend to take machine code programming seriously, you are strongly advised to get hold of an assembler as soon as you can. However, for the benefit of readers who feel that the extra expense is not justified, a simple program will be given later, enabling all machine code programs to be entered in hex instead of decimal digits.

The operand

This is the second part of the instruction, corresponding to the noun. It informs the microprocessor where the data (to be acted upon) can be found. The operand, in most cases, will be the address of the data. There are, however, several different ways of specifying the address. They are known as addressing modes. Some instructions may have as many as seven different addressing modes, whilst others may have only one. The operand can be specified in decimal or hex but, here again, hex addresses are much easier to work with.

Simple addressing modes

The most commonly used instruction in the repertoire is LDA so we shall use it for illustration purposes where ever possible. LDA is an assembler mnemonic for LoaD Accumulator. It is used to place data into the accumulator. The whereabouts of the data is specified by the operand according to the addressing mode used. At this point, only three of these addressing modes will be described.

Immediate addressing

Memory is not involved because the operand specifies the data. This data will be specified by two hex digits (one byte) within the range 00 and FF.

Suppose we want to load the accumulator with the hex number 05 and we have an assembler resident. The way in which the instruction is written depends on whether an assembler is used or whether you must use direct hex code. Both forms are given below:

Assembler	Hex code
LDA#$05	A9 05

Notice that the assembler requires the character '$' to indicate the number is in hex and the character '#' to indicate immediate addressing. In contrast, the hex code version is just two pairs of naked hex digits. The *first pair of hex digits is always the op-code.* The op-code for LDA, using immediate addressing, is A9. Why A9? Because the designers of the 6510A decreed it to be so. Without an assembler, you must either memorise the hex digit pair for every op-code (and there are over 200 of them) or consult the full instruction set of the 6510A. Perhaps this gloomy bit of information will act as a commercial break for the Mikro or Commodore assembler. It is called immediate addressing because the data is *immediately* available in the operand. It is used when we want to load constants.

Absolute addressing

This is used if the data byte, to be loaded into the accumulator, is in memory — anywhere in the 64K RAM. The operand is a four hex digit number (two bytes) specifying the memory address. You will remember that any address in the 64K memory map can be expressed with the aid of four hex digits. Suppose we wish to load the data byte, residing at address C2056 hex, into the accumulator. The assembler and hex code instruction become:

Assembler	Hex code
LDA $2056	AD 56 20

Notice that the hex op-code is now AD instead of A9. Notice also the strange reversal of the two operand bytes in the hex code version. This is a standard rule when using 6510A hex code so we had better emphasise it:

If direct hex code is used without an assembler, all two-byte operand addresses must be entered in reverse order, low-byte first, high byte last.

This is important enough to justify an extra example; the hex address 5472 must be entered as 72 54. The designers of the 6510A decided on this awkward twist because it led to more efficient organisation of the address bus. In machine code, the human is relatively unimportant so considerations of 'user friendliness' take second place to hardware efficiency. As can be seen in the example above, an assembler is a little kinder towards humans and the two operand bytes are entered in normal sequence.

Zero-page addressing

If the address of the required data happens to be on page zero ($0000 to $00FF) it is possible, in fact it is normally desirable, to use page zero addressing. It is more efficient because the two leading zeros can be dropped, allowing a single byte operand to be used. For example, to load the accumulator with the contents of the hex address 35, the assembler and hex code instructions would be:

Assembler	Hex code
LDA $35	A5 35

We shall see later that page zero is very important because

(a) two of the more exotic addressing modes only operate on data resident in page zero.
(b) data retrieval is faster from page zero than from other areas of memory.

Unfortunately, most of page zero has already been swiped by the resident operating system so there are very few vacant address locations left for the machine code programmer. In view of this, those which are left should be given VIP status and not used wastefully. We believe, although we can find no confirmation in Commodore literature, that:

Free locations in page zero = $FB to $FF inclusive.

Indexed and indirect addressing

These addressing modes are not so easy to understand and will be discussed in detail later in this series. However, for the sake of completeness, brief definitions are given below but, if you are completely new to machine code, don't worry too much about them yet.

Indexed addressing with LDA

The contents of one of the index registers is automatically *added to the operand* and the result is the address of the required data byte. Thus the same instruction can be used to access different addresses by simply altering the contents of the index register. There are three possible forms:
(a) Zero-page indexed, where only the X register can be used
(b) Absolute indexed, where either the X or Y registers can be used. Assembler and hex code formats, using arbitrary addresses, are as follows:

Address type	Assembler	Hex code
Zero-page,X	LDA $34,X	B5 34
Absolute,X	LDA $3456,X	BD 56 34
Absolute,Y	LDA $3456,Y	B9 56 34

Note the comma is used to inform the assembler that indexed addressing is required.

Indexed indirect addressing

An indirect address is the address of an address. This is not so bad as it sounds providing we first neglect the indexing by assuming that X (or Y as appropriate) contains zero. The operand is the low-byte address (which must be in page zero) of a two byte address pointer. The high byte of the pointer is in the *next sequential location*. As a preliminary example, using standard assembler notation, assume we write LDA ($FB,X). Assume that address $FB contains $56 (the low-byte of the pointer) and the next higher address contains $CO (the high-byte of the pointer). The effect of the instruction is to load the accumulator with the contents of address $CO56. However, things are a little more complex when the effect of the index register is taken into consideration. Suppose X contains the number 2 and we again write LDA ($FB,X). The low-byte address is now increased to $FB+2=$F so an entirely different pointer is effective.

The advantage is flexibility. The same instruction can be used to access different data items simply by varying either the address pointers or the index register. Assembly format and hex coding, using arbitrary addresses, is as follows:

Assembler	Hex code
LDA ($FB,X)	A1 FB

Indirect indexed addressing

This is similar in general principle to indexed indirect. The essential difference being in the way indexing is used. Firstly, only Y can be used for indexing. Secondly, the contents of Y is added to the address pointer, rather than to the operand. An example should illustrate the difference. Using standard assembler format for indirect indexed addressing, suppose we write LDA ($FB),Y and that Y contains 2. Let us also assume, as before, that address $FB contains $56 (the low-byte pointer) and the next address contains $CO (the high-byte pointer). Because 2 is now added to the address pointer, it effectively becomes $CO56+2=$CO58. The assembler and hex coding, using arbitrary addresses, for indirect indexed is as follows:

Assembler	Hex coding
LDA ($FB),Y	B1 FB

Indirect indexed addressing is used much more often than indexed indirect. Note how easy it is to get mixed up with the position of the assembler brackets. Lets put them together to emphasise the difference.

Indexed indirect...LDA ($FB,X)
Indirect indexed...LDA ($FB),Y

It is worth mentioning that the older terms were as follows: Indexed indirect was called post indexing (because the index was added afterwards). Indirect indexed was called pre-indexed (because the index was added first).

How to enter a machine code program

Up to this point, we have only used the instruction LDA to illustrate the technicalities of machine code and readers may be wondering how much longer they must wait before the rest of them are discussed. The trouble with machine code is that the various addressing modes are far more difficult to understand than differences between the instructions themselves. We have tackled the hardest part first. As we subsequently treat the other instructions, short program segments will be given to illustrate the behaviour of each. However, before we go any further, we must know how to enter a machine code program and afterwards, how to run it. We shall assume in the first instance that you do not have an assembler. Program 3.1 is a simple way to enter a program into the safe area of memory which, you may remember from Part 1 of the series, is the 4K block starting at address $C000.
The program, written in BASIC, allows you to enter hex machine code bytes in the form of DATA statements. You should key in the program and save it on tape or disc for use whenever you want to load machine code. The hex bytes shown are, of course, only an example so, once you have tried it out once, there is no need to save lines 140 to 180. When you load your own programs, or some of the examples which will appear throughout the series, you will have to enter the bytes in the form shown in lines 140 onwards. Once you have entered the bytes and the BASIC program run, you will be asked, via a screen message, the number of bytes used. In the example, there are 33 bytes. Once you have entered the number of bytes, the program will place them in memory starting at $C000. It will be up to you to ensure that the DATA bytes, which we shall refer to in future as a 'hex dump', are entered in the correct sequence. You will notice that the data bytes in the example are placed in groups of eight. This is for convenience (they are easy to count up if you stick to this number) and also because it is customary in machine code monitors to display the bytes in groups of eight.

```
10 REM POKING A HEX DUMP INTO MEMORY
20 REM STARTING AT ADDRESS $C000
30 INPUT"HOW MANY BYTES IN HEX DUMP";N%
40 B=49152
50 FOR L=0 TO N%-1
60 READ D$
70 FD%=ASC(D$)-48
80 SD%=ASC(RIGHT$(D$,1))-48
90 IF FD%>9 THEN FD%=FD%-7
100 IF SD%>9 THEN SD%=SD%-7
110 BT%=16*FD%+SD%
120 POKE B+L,BT%
130 NEXT
140 DATA A9,00,85,FB,A9,05,85,FC
150 DATA A9,48,20,CA,F1,38,A5,FB
160 DATA E9,01,85,FB,B0,02,C6,FC
170 DATA A5,FB,D0,EC,A5,FC,D0,E8
180 DATA 60
```

Program 3.1 Poking a hex dump into memory

Running a machine code program

Program 3.1 is purely a loading program. When you run it, it merely loads the machine code into memory — it does not execute the machine code! To execute the code, you should now enter

```
SYS 49152
```

This directs the computer to start executing the bytes, one after the other, starting at the decimal address 49152. This is, of course, $C000. If you have entered Program 3.1 as it stands, including the example 33 bytes, you should confirm that the machine code, when run under SYS 49152, will completely fill the screen with 'H' characters. In fact, 1024 of them are displayed but the last 24 will naturally cause the screen to scroll. Don't worry at this stage about how the machine code works. If you are a complete newcomer, it would be very surprising if you could since several tricks have been used which have not yet been explained. You should notice however that the last byte is hex 60 which is the machine code version of RETURN from subroutine. Most of your programs will end in 60 in order to allow a smooth re-entry to BASIC command level once the machine code program has stopped.

The example program works directly you run it but some machine code programs require some extra data before they can be run. In such cases, it will be up to you to POKE such data into the correct memory locations before entering SYS 49152. It should be mentioned here that it is not mandatory to always load at the start of the machine code block. After all, there is 4K available so there is nothing to stop you loading your program in the middle of the block. However, there is no point in being original just for its own sake. If you get into the habit of loading at $C000 onwards, there is less chance of making a mistake. It also allows you plenty of room at the end of the program to store any extra data required.

LDX and LDY

These load the contents of the chosen index register with data defined by the operand.

STX and STY

These store the contents of the chosen index register in the memory address defined by the operand.

STA

This stores the contents of the accumulator in memory at the address defined by the operand.

The addressing modes available, together with assembler and hex coding are given in the following table using xx to represent a single operand byte:

	Assembler	Hex code
Load X	LDX # $xx	A2 xx
	LDX $XX	A6 xx
	LDX $xxxx	AE xx xx
	LDX $xx,Y	B6 xx
	LDX $xxxx,Y	BE xx xx
Load Y	LDY # $xx	A0 xx
	LDY $xx	A4 xx
	LDY $xxxx	AC xx xx
	LDY $xx,X	B4 xx
	LDY $xxxx,X	BC xx xx
Store X	STX $xx	86 xx
	STX $xxxx	8E xx xx
	STX $xx,Y	96 xx
Store Y	STY $xx	84 xx
	STY $xxxx	8C xx xx
	STY $xx,X	94 xx
Store A	STA $xx	85 xx
	STA $xxxx	8D xx xx
	STA $xx,X	95 xx
	STA $xxxx,X	9D xx xx
	STA $xxxx,Y	99 xx xx
	STA $xxxx,Y	99 xx xx
	STA ($xx,X)	81 xx
	STA ($xx),Y	91 xx

From what has been said already, it should be possible to figure out the name of each addressing mode in this table by simply examining the assembler format. Notice that some instructions have a limited addressing repertoire. For example, you can't use indirect addressing with LDX or LDY. On the other hand, STA has as many addressing modes as LDA with the exception of the immediate mode. A moment's thought should convince you that it is impossible to have immediate mode with any store-type instruction. There is only one operand so you can't express both the data and where to put it in one single instruction.

Exercises

To conclude Part 3, here are some exercises which should help you to become familiar with some of the more simple addressing modes. Write each program, enter it with the aid of the loader (Program 3.1), run it under SYS 49152 and see if it behaves:

1. Display a character of your own choice in the middle of the screen.
2. Display two different characters, side by side, in the middle of the screen.
3. Display your name across the bottom of the screen.

Warning: dont forget to count your bytes and make sure you choose the right op-codes and in the right sequence or, sure as hell, you will crash the system. Answers will be given in Part 4.7.

"dialog...

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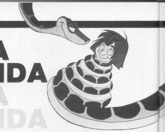
Gather speed and momentum, and accumulate points, as you wind your way around the screen hitting the boxes and dollar signs which flash in your path with this nail-biting game from 'Peter Pann'.

ANA CONDA

ANA CONDA



THE AIM OF THIS GAME IS to move your 'snake' (ie, a length of coloured circles preceded by an arrow) around the screen using the following keys:

A(left) D(right) I(up) M(down)

As you worm your way around the screen, you score points by hitting the boxes which suddenly appear (and, to add to your frustration, frequently disappear before you can reach them): the number of points you score depends on the number (from 1 to 9) inside the box you pierce. Additionally you can score bonus points by hitting '$ signs'; these bonus points are then added to your score after you hit your next box. The number of bonus points scored depends on the length of your 'snake' which grows as the game progresses, but reduces again once the '$ sign' has been confronted. The longer your 'snake', the more carefully you have to tread as it is easy to entwine yourself in a maze of 'snake'. The game ends when you hit the boundary or turn back on yourself.

Program Listing

```
5 POKE53280,12:POKE53281,12
41 PRINTTAB(9)"▚(PRESS A KEY TO PLAY)
42 GETA$:IFA$=""THEN42
50 POKE49152,0:X=2000
60 E=53280:E1=53281:E2=49152:Q=54272
70 POKEE,0:POKEE1,0:PRINTCHR$(14)"▝▇▚    ";:IFPEEK(E2)>0THENX=100
75 PRINT"  ________________":PRINT"      ▚   ♠/♠┬/‾♠    ":L=PEEK(E2):FORJ=1TOL
90 HS$=HS$+STR$(PEEK(E2+J)):NEXT:HS=VAL(HS$):GOSUB1000:PRINT"▚▜▏UIDE THE MOVING
'SNAKE' USI";
120 PRINT"NG THE KEYS:":GOSUB1000:PRINT"  ▚♠▝(LEFT),  ▚┬▝(RIGHT),  ▚↖▝(UP),  ▚↖▝
(DOWN)▜
130 GOSUB1000:PRINT"▚┬ON'T HIT THE BOUNDARY (OR YOURSELF),     AND TRY TO HIT TH
E";
140 PRINT" BOXES FOR POINTS.▚":GOSUB1000:PRINT"▩▏ITTING ▚$▩ CREATES A BONUS WHIC
H WILL BE"
150 PRINT"  COLLECTED AFTER /‾♠▏ SCORE.":GOSUB1000:PRINT"▚▜▏OU HAVE AS LONG AS Y
OU LIKE T";
159 PRINT"O GET THE   HIGHEST NUMBER OF POINTS!":GOSUB1000:PRINT"▚▝▏OOD LUCK!":G
OSUB1000
171 PRINT"▇▚      ▚ HIT ANY KEY TO START ":GOSUB1000:FORJ=0TO24:POKEQ+J,0:NEXT:DI
MP(800),D(3)
175 DIMV(8),H(8),T(8),R(8):K=.1:W2=300:BO=1:POKE828,8
180 GETZ$:IFZ$=""GOTO180
185 GOSUB800:D(0)=22:D(1)=60:D(2)=62:D(3)=30:T9=1024:T6=3599:GOSUB220:GOTO230
220 POKEQ+5,36:POKEQ+6,36:POKEQ+4,129:RETURN
230 PRINTCHR$(142)"▝▜◣SCORE: ▜0         ▚BONUS X 1    ◣HI:▚"HS"▜":FORJ=1064TO1103:
POKEJ,67
240 POKEQ+1,J-1000:POKEJ+Q,7:NEXT:FORJ=1984TO2023:POKEJ,67:POKEQ+1,J-1900:POKEJ+
Q,7:NEXT:L=40
260 FORJ=1104TO1944STEP40:POKEJ,66:POKEJ+Q,7:POKEJ+39,66:POKEJ+39+Q,7:POKEQ+1,IN
T(J/10):NEXT
265 POKE1064,85:POKE1103,73:POKE1984,74:POKE2023,75:V=5:H=5:V1=0:H1=1:P2=10:D1=2
280 TI$="000000":T=TI
290 SS=TI:W%=INT((10-3)*RND(1))+3:IFPEEK(828)=W%THENW%=W%+1
292 POKEQ+24,15
300 GETZ$:IFZ$=""GOTO330
302 IFZ$="M"THENZ=0
```

Program Listing

```
308 IFZ$="D"THENZ=2
309 GOSUB220:POKEQ+24,15
320 D1=Z:D=Z-1.5:V1=INT(ABS(D))*SGN(D):H1=SGN(D)-V1
330 V=V-V1:H=H+H1:P=T9+V*L+H
350 P9=PEEK(P):FORI=21TO3STEP-7:POKEQ+2,I:NEXT:POKEQ+1,W%
360 R6=R7:R7=R7+1:IFR7>P2THENR7=0
370 P1=P(R7):P(R7)=P:IFP1<>0THENPOKEP1,32
380 POKEP,D(D1):POKEP+Q,3:P1=P(R6):IFP1<>0THENPOKEP1,81:POKEP1+Q,W%
382 IFTI>W1+W2ANDPEEK(W)=36THENPOKEW,32:W=0
383 IFPEEK(W)<>36THENW=0
384 M=0:IFP9<>36THEN390
385 IFPEEK(P(M))=81THENMM=MM+1
386 POKEP(M)+Q,W%:POKEP(M),15:W=W+1:PRINT"▒"TAB(20)"▒▒"MM"▌▀  ":IFW>200THENW=1
387 POKEQ+1,W:M=M+1:IFM=1THENGOSUB800:GOSUB220:POKEQ,0
388 IFP(M)>0THEN385
389 W2=W2+20:W=0:POKE828,W%:GOTO400
390 IFP9<>32GOTO540
400 IFRND(1)>KGOTO290
410 V%=RND(1)*L/10:P9=86+V%:V9=V(V%):IFV9>0GOTO591
470 V2=INT(RND(1)*20)+3:H2=INT(RND(1)*(L-4))+2
480 FORV3=V2-1TOV2+1:P3=V3*L+T9:FORH3=H2-1TOH2+1:IFPEEK(P3+H3)<>32GOTO470
490 NEXTH3,V3:V(V%)=V2:H(V%)=H2
500 ZZ=INT(RND(.5)*7+9):FORV3=V2-1TOV2+1:P3=V3*L+T9:FORH3=H2-1TOH2+1
510 POKEQ+4,17:FORI=1TO25STEP2:POKEQ+1,I:NEXT:POKEQ+4,129
520 POKEP3+H3,P9:POKEP3+H3+Q,ZZ
530 NEXTH3,V3:T=9*RND(1):P8=V2*L+H2+T9:POKEP8,49+T:T(V%)=T:R(V%)=P8:GOTO290
540 V%=P9-86:IFV%<0THENGOSUB800:GOTO600
550 P8=R(V%):T=T(V%):P2=P2+7:T$=TI$
560 T=T-1:S=S+1*BO:POKEP8,T+49:FORI=1TO10STEP3:POKEQ+1,I:NEXT:FORI=10TO1STEP-2:P
OKEQ+1,I:NEXT
564 IFS>1499THENBO=10:GOTO570
565 IFS>999THENBO=5:GOTO570
566 IFS>299THENBO=3:GOTO570
570 IFW>0THEN578
571 W=INT(RND(1)*(2023-1064)+1064):IFPEEK(W)=32THENPOKEW,36:GOSUB900:W1=TI
578 S=S+MM*BO:PRINT"▀▒▌▌▌▌▌▌▌"S;TAB(20)"▒ X"BO"▌   ":MM=0
580 POKEQ+4,33:FORJ=100TO65STEP-2:POKEQ+1,J:NEXT:POKEQ+4,129:IFT>=0GOTO560
590 P2=P2+7:TI$=T$:V9=V(V%)
591 FORV3=V9-1TOV9+1:P3=V3*L+T9:H9=H(V%)+P3:FORH3=H9-1TOH9+1
594 POKEH3,32:NEXTH3,V3:V(V%)=0:POKER(V%),32:GOTO290
600 POKEQ+4,17:FORI=254TO0STEP-2:POKEQ+1,I:POKEE,I:POKEE1,I+1:NEXT:POKEE1,0:POKE
E,0
620 IFS>HSTHENGOSUB660
625 POKEQ+24,0:PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌___________________________"
626 PRINT"▌▌▌▌▌▌▌▌▌▒   ANOTHER GAME?  /      ▀▌▌▌▌▌▌▌";:X=100
630 GETZ$:IFZ$=""THENPRINT"▒▒▌ ▌▌▌▌";:GOSUB1000
635 IFZ$=""THENPRINT"▒ ▌N▌▌▌▌";:GOSUB1000:GOTO630
640 IFZ$="Y"THENPRINT"▒":RUN60
650 IFZ$="N"THENEND
651 GOTO630
660 S$=STR$(S):L=LEN(S$):POKEE2,L:FORJ=1TOL:POKEE2+J,VAL(MID$(S$,J,1)):NEXT:RETU
RN
800 POKEQ+1,230:POKEQ+5,9:POKEQ+15,30:POKEQ+24,15:POKEQ+4,21:FORJJ=255TO1STEP-10
:POKEQ+1,JJ
805 POKEE,JJ:NEXT:IFM=1THENPOKEE,0:RETURN
810 FORJJ=16TO0STEP-2:POKEQ+24,JJ:FORA=1TO100STEP11:POKEQ+4,A:POKEE,JJ:NEXTA,JJ:
POKEQ+24,15:RETURN
900 POKEQ+1,100:POKEQ+5,9:POKEQ+15,30:POKEQ+4,21:FORJJ=15TO0STEP-3:POKEW+Q,JJ:PO
KEE,JJ
910 FORA=15TO1STEP-3:POKEQ+24,A:POKEE,A:POKEE,A:NEXTA,JJ:POKEQ+24,15:POKEE,0:GOS
UB220:POKEW+Q,1:RETURN
1000 POKEQ,240:POKEQ+1,33:POKEQ+5,8:POKEQ+22,104:POKEQ+23,1:POKEQ+24,79:POKEQ+4,
129:FORJ=1TO30
1010 NEXT:POKEQ+4,128:FORJ=1TOX:NEXT:RETURN
```

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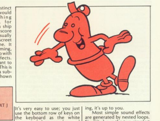
In the third part of this series, Bryn Phillips invites you to irritate the neighbours by adding sound to your VIC games.

VIC GAMES PROGRAMMING



THIS IS THE THIRD OF A FIVE part series of BASIC Games Programming for the VIC20. The series is primarily intended for newcomers to games programming, but there might well be a few useful tips for seasoned programmers.

So far we've looked at two of the main elements of Games Programming on the VIC 20 — screen layout and movement. Even without sound you can write some good games. In fact some games are better with the minimum of sound — especially thinking games — it can be a distraction. However for most action games imaginative use of sound can make all the difference. As a VIC owner you have a big advantage in this area, because the sound comes through the T.V. speaker, giving you lots of volume. You're not limited to the odd pathetic bleep or click, either — you have an amazing variety of sound effecs to draw on.

Tuning into the VIC

The VIC has five sound registers, four for tone, and one for volume. As with most things on the VIC you have to POKE values into these registers, which have the following memory locations:

	Memory Location	Range
Volume	36878	0–15
Tone (low)	36874	128–255
Tone (med)	36875	128–255
Tone (high)	36876	128–255
Tone (noise)	36877	128–255

In order to use sound effectively in Games Programming it must be carefully planned, and not just slotted in somewhere at the end of the program as an afterthought. There are two ways of using sound. It can be put in in discreet packages, or carefully integrated into the program structure.

One of the most valuable uses of sound in a program is to add interest or excitement either when there is no action, for example the introduction, or where there is a distinct pause in the action. This would occur when something spectacular happens, for example an explosion, a ship sinking, or a bonus score message. Here you can usually put the sound in as a discreet package in a subroutine. This makes for neat programming, and allows you to come up with some sophisticated effects. Sometimes you might want to play a few bars of a tune. This is easily done by going to a subroutine along the lines shown in fig(i).

```
10 POKE V,15
20 FORI=1TO10
30 POKES,N(I)
40 FOR J=1 TO 200: NEXT J
50 NEXTI
60 POKEV,0:POKES,0
```

fig (i)

Where V is the volume register, S is a sound register, and the array N(I) contains the notes of the tune, which you define earlier in the program. This sounds a bit flat though, and you can make it more interesting by enveloping the sound to give different effects. The simplest is the piano effect, and this is done by decaying the volume as outlined in fig (ii).

```
10 FORI=1TO10
20 FORVL=15TO0STEP-1
30 POKES,N(I):POKEV,VL
40 NEXTVL
50 NEXTI
60 POKES,0
```

fig (ii)

Hitting the right note

All you need to do now is to find some notes to give you a tune. Rather than constantly refer to the table of note values in the User's Manual, it's far easier to use a utility program to help you compose the tunes. The utility program, COMPOSER (Listing 1), allows you to compose short tunes (20 notes max), and provides you with the values to include in the data statements in your program. It's very easy to use; you just use the bottom row of keys on the keyboard as the white notes, and the second row of keys as the black notes. Any other keys will give you a single note pause. You can easily change the tune using delete, and play it back at any time using f7. This program is deliberately simple. Without too much effort you could convert your VIC into a neat little sound synthesiser, with chords, drums, and melody lines. But that would be getting away from Games Programming — it would use up valuable memory, and we need that for other things.

Effecting sound

Now let's get on to the sound effects. Probably one of the first things you did when you acquired your VIC 20 was to type in some of the sound effects at the back of the manual. Some of them are very good, and they crop up from time to time in programs here and there. It's tempting to leave it at that — as I said some of them are very good. Unfortunately they're not original — they were thought up by someone else. If you're writing your own programs you want your own sound effects which exactly fit your theme; whether it's ducks quacking, tyres screeching, or aliens screaming, it's up to you.

Most simple sound effects are generated by nested loops. Fig (iii) shows the two simplest loops.

```
10 FOR J = 1 TO RP
20 FORNT = N1 TO N2 STEP SN
30 FOR V =V1 TO V2 STEP SV
40 POKE VL,V
50 POKE S,NT
60 NEXTV
70 FOR I = 1 TO 100*PS:NEXT I
80 NEXT NT
90 NEXT J
100 POKE V,0:POKE S,0
```

LOOP 1

```
10 FOR J = 1 TO RP
20 FOR V = V1 TO V2 STEP SV
30 FOR NT =N1 TO N2 STEP SN
40 POKE VL,V
50 POKE S,NT
60 NEXT NT
70 FOR I = 1 TO 100*PS:NEXT I
80 NEXT V
90 NEXTJ
100 POKEVL,0:POKE S,0
```

LOOP 2

fig (iii)

In Loop 1 the volume loop is nested within the tone loop, and in Loop 2 the tone loop is nested within the volume loop. Loop 1 can be used to give some pleasant musical effects, and Loop 2 really comes into its own for those wierd alien sound effects we

have all learned to love (or hate?). If you type in the utility program "MANIAC SYNTHESISER" (Listing 2), you can play with these loops to your heart's content, and when you get an effect you like just copy down the values for inclusion into the loops given in fig (iii). I've made up a table of some values you might like to try when you start off, but whether you agree with my descriptions of these sounds is another matter!

DESCRIPTION	RG	N1	N2	SN	V1	V2	SV	PS	RP	LOOP
Aliens coming	3	150	200	5	5	15	3	0	5	2
Cricket	3	230	232	1	0	15	5	0	10	2
Machinery	4	230	240	1	15	5	–3	0	3	1
Knock on wood	4	200	160	–10	15	5	–5	0	3	2
Knock on metal	2	200	160	–10	15	5	–5	0	3	2
Piano	2	200	130	– 5	15	5	–1	0	1	1
Phaser firing	2	200	130	– 5	15	5	–1	0	1	2
Something (?!) coming	1	250	130	– 5	15	5	–5	0	10	2

When you type in the program it's important to make sure you get the screen formatting right, but otherwise there should be no problems. Loops 1 and 2 have been included in this program as subroutines, and if you follow the listing through you will see that it's quite easy to add your own customised loops if you want to experiment further.

Integrating sound

Earlier in this article I mentioned Integrated Sound. The only problem of going to a subroutine each time you want to hear something is that it slows down the action. Even worse, it can make the whole thing jerky if the sound only occurs occasionally. In order to avoid this you have to integrate your sound effect into the structure of the program. This can take some thinking about, and will vary from program to program. The trick is to find natural delays in your program structure, and never use FOR/NEXT loops simply to hold a note. You have to first write your program, then sketch out your sound efect sub-program and merge the two. The speed of the action should not change when the sound effect occurs — you will just get a slight reduction in the overall speed. The more complex the effect the greater the reduction. The answer is not to go overboard with the integrated sound effects — keep them simple. You can save the sound extravaganza for the triumphs and disasters, as you savour the moment of victory, of flounder in defeat.

The difference between Integrated Sound and the use of subroutines is shown in Listing 3 and Listing 4. Back to the bouncing ball featured in the last article. In both programs a ball bounces around the screen, and bleeps each time it hits the edge. In BOUNCE A the program goes to a subroutine to generate the sound, and in BOUNCE B the sound is integrated. It's a very simple example, but if you RUN the two programs you should notice the difference.

So far we've been talking about aliens, frogs, rockets etc, and all we've got is the VIC's standard graphic set. If you've got a lot of imagination you are probably quite happy with that — but it does take a lot. A square falling from a rectangle can be interpreted as a bomb falling from a plane, but a bit of realism would bring it all to life. That's what I'll be covering in the next article in this series. It's all about User Defined Graphics (UDG's) — they make all the difference.

Listing 1

```
10 REM COMPOSER
20 :
30 REM BRYN PHILLIPS
40 :
50 REM 1984
60 :
70 REM INIT KEYBOARD
80 :
90 DIML(18):DIMN(18):DIMN$(18)
100 DIMPH$(22):DIMNT(22)
110 V=36878:S=36876
120 FORJ=1TO17:READL(J):NEXT
130 FORJ=1TO17:READN(J):NEXT
140 FORJ=1TO17:READN$(J):NEXT
150 :
160 :REM SCREEN DISPLAY
170 :
180 PRINT"♥"
190 GOSUB660
200 J=0
210 :
220 REM COMPOSE
230 :
240 GETA$
250 IFA$=""THEN240
260 IFA$="■"THENRUN
270 IFASC(A$)=20THENGOSUB440:GOTO240
280 IFA$="▮"THENGOSUB540:GOTO240
290 J=J+1:IFJ>20THENJ=20:GOTO240
300 NT(J)=0:PN$(J)="PS "
310 FORI=1TO17
320 IFL(I)=ASC(A$)THENNT(J)=N(I):PN$(J)=N$(I)
330 NEXTI
340 IFNT(J)=0THEN390
350 FOR VL=15TO0STEP-1
360 POKES,NT(J):POKEV,VL
370 NEXTVL
380 POKE V,0:POKES,0
390 PRINTTAB(1)PN$(J);TAB(4)NT(J)
400 GOTO240
410 :
420 REM DELETE NOTE
430 :
440 IFJ=0THENRETURN
450 J=J-1
460 PRINT"♥":GOSUB660:IFJ=0THEN RETURN
470 FORK=1TOJ
480 PRINTTAB(1)PN$(K);TAB(4)NT(K)
490 NEXT
500 RETURN
510 :
520 REM PLAY TUNE
530 :
540 FORK=1TOJ
550 IFNT(K)=0THEN590
560 FOR VL=15TO0STEP-1
570 POKES,NT(K):POKEV,VL
580 NEXTVL
590 FORTT=1TO200:NEXTTT
600 NEXTK
610 POKE V,0:POKES,0
620 RETURN
630 :
640 REM SCREEN DISPLAY
650 :
660 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶▶▶ COMPOSER "
670 PRINT"▼▼▼▶▶▶▶▶▶▶▶▶▶▶▶▶USE LOWER"
680 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶KEYS AND "
690 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶DELETE TO"
700 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶COMPOSE. "
710 PRINT"▼▼▶▶▶▶▶▶▶▶▶▶▶F7 TO PLAY"
720 PRINT"▼▶▶▶▶▶▶▶▶▶▶▶F1 RE-RUN■"
730 RETURN
740 :
750 REM DATA
760 :
770 DATA 90,83,88,68,67,86,71,66,72,78,74,77,44,76,
46,58,47
780 DATA135,143,147,151,159,163,167,175,179,183,187
191,195,199,201,203,207
790 DATAC ,C# ,D ,D# ,E ,F ,F# ,G ,G# ,A ,A# ,B ,C
,C# ,D ,D# ,"E "
```

Listing 2

```
10 REM MANIAC SYNTHESISER
20 :
30 REM BRYN PHILLIPS
40 :
50 REM 1984
60 :
70 FORI=1TO9:READPS(I):NEXT
80 FORI=1TO9:READOP(I):NEXT
90 FORI=1TO9:READLL(I):NEXT
100 FORI=1TO9:READUL(I):NEXT
110 FORI=1TO4:READS(I):NEXT
120 VL=36878
130 SN=5:SV=3
132 :
134 REM DEFINE STRINGS
136 :
140 F1#="■■■■■■■■■■■■■■■■■■■■■■■■■ F1  FOR OPTIONS  "
150 CF#="■■■■■■■■■■■■■■■■■■■■■■■■                     "
160 CK#="■■■■■■■■■■■■■■■■■■■■ USE CURSOR KEYS  "
170 CC#="■■■■■■■■■■■■■■■■■■■                  "
172 :
174 REM SCREEN DISPLAY
176 :
180 POKE36879,28
190 PRINT"■■■MANIAC SYNTHESISER"
200 PRINT"■■■1■ REGISTER  ■RG■  3"
210 PRINT"■■■2■ 1ST  NOTE ■N1■150"
220 PRINT"■■■3■ END  NOTE ■N2■200"
230 PRINT"■■■4■ STEP NOTE ■SN■  5"
240 PRINT"■■■5■ 1ST  VOL  ■V1■  5"
250 PRINT"■■■6■ END  VOL  ■V2■ 15"
260 PRINT"■■■7■ STEP VOL  ■SV■  3"
270 PRINT"■■■8■ PAUSE     ■PS■  0"
280 PRINT"■■■9■ NO.REPEAT ■RP■  5"
290 PRINT"■■■■                      "
300 PRINT"■■■ 1-8 CHANGE VALUE "
310 PRINT"■■■ F5  LOOP 1       "
320 PRINT"■■■ F7  LOOP 2       "
330 PRINT"■■■                  "
332 :
334 REM SELECT OPTION
336 :
340 GETA#
350 IFA#=""GOTO340
360 IFVAL(A#)>0ANDVAL(A#)<10THENCL=28:J=VAL(A#):GOSUB620:
PRINTCHR#(28)F1#;CK#:G OTO400
370 IFA#="■"THENGOSUB740:REMF7
380 IFA#="■"THENGOSUB860:REMF5
390 GOTO340
392 :
394 REM CHANGE VALUE
396 :
400 GETA#
410 CL=28:GOSUB620
420 IFA#="■"THENCL=144:GOSUB620:PRINTCHR#(28)CC#;CF#:GOTO340
430 IFA#="■"THENOP(J)=OP(J)+1:IFOP(J)>UL(J)THENOP(J)=UL(J)
440 IFA#="■"THENOP(J)=OP(J)-1:IFOP(J)<LL(J)THENOP(J)=LL(J)
450 OP#=STR#(OP(J))
460 LG=LEN(OP#)
470 OP#=MID#(OP#,2,LG-1)
480 IFLG=3THENOP#=" "+OP#
490 IFLG=2THENOP#="  "+OP#
500 PRINT"■"
510 FORI=1TOPS(J)
520 PRINT
530 NEXTI
540 PRINTCHR#(144)TAB(16);OP#
550 SV=SGN(OP(6)-OP(5))*OP(7)
560 SN=SGN(OP(3)-OP(2))*OP(4)
570 IFSV<0THENK=7:SG#="-":GOSUB680
580 IFSV>0THENK=7:SG#=" ":GOSUB680
590 IFSN<0THENK=4:SG#="-":GOSUB680
600 IFSN>0THENK=4:SG#=" ":GOSUB680
610 GOTO400
612 :
614 REM PRINT OPT SUB
616 :
620 PRINT"■"
630 FORI=1TOPS(J)
640 PRINT
650 NEXTI
660 PRINTCHR#(CL)"■■"MID#(STR#(J),2,1)"■"
670 RETURN
672 :
674 REM PRINT SIGN SUB
676 :
680 PRINT"■"
690 FORI=1TOPS(K)
700 PRINT
710 NEXTI
720 PRINTTAB(16)SG#
730 RETURN
732 :
734 REM LOOP 2
736 :
740 FORN=1TOOP(9)
750 FORV=OP(5)TOOP(6)STEPSV
760 FORNT=OP(2)TOOP(3)STEPSN
770 POKEVL,V
780 POKES(OP(1)),NT
790 NEXTNT
800 FORI=1TOOP(8)*100:NEXTI
810 NEXTV
820 POKES(OP(1)),0
830 POKEVL,0
840 NEXTN
850 RETURN
852 :
854 REM LOOP 1
856 :
860 FORN=1TOOP(9)
870 FORNT=OP(2)TOOP(3)STEPSN
880 FORV=OP(5)TOOP(6)STEPSV
890 POKEVL,V
900 POKES(OP(1)),NT
910 NEXTV
920 FORI=1TO100*OP(8):NEXTI
930 NEXTNT
940 POKES(OP(1)),0
950 POKEVL,0
960 NEXTN
970 RETURN
972 :
974 REM DATA
976 :
980 DATA 1,3,4,5,7,8,9,11,12
990 DATA3,150,200,5,5,15,3,0,5
1000 DATA1,128,128,1,0,0,1,0,1
1010 DATA4,255,255,20,15,15,15,10,25
1020 DATA36874,36875,36876,36877
```

Listing 3

```
10 REM BOUNCE A
20 :
30 V=36878:S=36875
40 P1=8164:P2=38884
50 CH=81:CL=2
60 X=10:Y=0:X1=10:Y1=Y
70 DX=1:DY=1
80 PRINT"■"
90 X=X+DX:Y=Y+DY
100 IFX<1ORX>20THENDX=DX*-1:GOSUB170
110 IFY<1ORY>21THENDY=DY*-1:GOSUB170
120 POKEP1+X1-22*Y1,32
130 POKEP1+X-22*Y,CH
140 POKEP2+X-22*Y,CL
150 X1=X:Y1=Y
160 GOTO90
170 POKEV,15
180 POKES,210
190 FORI=1TO50:NEXT
200 POKEV,0:POKES,0
210 RETURN
```

Listing 4

```
10 REM BOUNCE B
20 :
30 V=36878:S=36875
40 P1=8164:P2=38884
50 CH=81:CL=2
60 X=10:Y=0:X1=10:Y1=Y
65 POKES,210
70 DX=1:DY=1
80 PRINT"■"
90 X=X+DX:Y=Y+DY:POKEV,0
100 IFX<1ORX>20THENDX=DX*-1:POKEV,15
110 IFY<1ORY>21THENDY=DY*-1:POKEV,15
120 POKEP1+X1-22*Y1,32
130 POKEP1+X-22*Y,CH
140 POKEP2+X-22*Y,CL
150 X1=X:Y1=Y
160 GOTO90
```

Mike Roberts and Simon Rockman investigate the smaller of Commodore's new offspring, the Commodore 16.

16: COMMODORE'S LATEST NUMBER

THE COMMODORE 16 IS packaged in the same type of box that has clothed Commodore 64s and VICs for the past few years. The machine's colour scheme is rather different to the CBM 64; it looks like a negative — gunmetal box and a grey keyboard.

The ports at the back of the box show a departure from the 64/VIC stable with the omission of the RS232C interface and the parallel user port.

Most remaining features have been changed: the cartridge/expansion port has been reduced in size to stop people shoving CBM64 cartridges into a C16. Commodore say that no RAM memory expansion will fit into this slot, only cartridges, although 'Memory Expansion' is written above it. Commodore's answer is "We know"; apparently the moulding was made by a Chinaman or something. It is unknown whether the highly advanced structure of the CBM 64's slot is duplicated with the facility for second processors etc.

The two D9 connectors of the CBM 64 have been dispensed with and replaced with mini DIN connectors: this means you can only use Commodore's joysticks but even their new 'hi-tec' style ones are not the best on the market. This is foolish since it is so easy to make an adaptor for use with any joystick. No doubt there will be a roaring trade in adaptors. There is also one other problem with joysticks: on the box they are labelled 'PORT 0' and 'PORT 1': BASIC thinks they are 'JOY (1)' and 'JOY (2)' — the mysterious Chinaman perhaps?

The cassette recorder socket is also a mini DIN connector; this is because the C16 cassette deck is different to the old tape decks. This doesn't really matter with the C16 as a cassette deck gets supplied with the computer.

Thankfully, Commodore have left the Serial BUS and the audio/video connector alone. Since all Commodore's existing peripherals which use these ports will work straight off, there are already printers and disc drives available for the machine: this is a welcome change from the usual state of affairs where the user has to wait up to two years for any peripherals at all.

The keyboard is up to Commodore's usual excellent standards and probably represents most of the component cost of the machine (it did on the CBM64 and VIC). Changes made from the VIC/64 keyboard include four separate cursor keys, an escape key, and various modifications to the layout of the keys to facilitate these changes. The cursor keys are now on the top right of the keyboard. This is confusing to a user who is experienced with the Commodore keyboard of old, but it is extremely logical and easy to get used to for the first time user.

Inside the C16

The internal hardware reveals some surprises. Most of the inside is driven via one big chip: called either the 7501 or the TED chip depending on your inclination, it combines a 6510 processor at 2MHz with a sound generator, timers, input/output, memory banking, and graphics generation. In all it has 19 registers to control things (in order of graphics ability: the Spectrum has 1, MSX has 6, the BBC has 17, the Commodore 64 has 47).

Sound ability is as good as any other computer although it only has two channels — either two sound channels or one sound and one noise (for special effects). Nearly all the advanced sound features of the SID chip have been left out like ADSR, filtering, and modulation.

Graphics ability is superb. It is natural that this and the Plus 4 will be compared with the Commodore 64 as there are a lot of similarities in spec; the graphics are different and there are currently two schools of thought as to which is better, the CBM64 or the C16

No sprites. . .

The big difference lies with sprites. These wonderful things that make games programming easy have been chopped from the C16. In their place is a software simulation of them from BASIC where you can extract an area of the screen and store it in a string. This string can then be recalled and put back on the screen at any point. There are also other options to manipulate these objects, but they are not true sprites; a large 120 byte object takes about a quarter of a second to write to the screen. I feel that the world can live without sprites for at least another computer generation (about 18 months); the Commodore 64 and Atari were just too far ahead of their time.

. . .But more colour

The trade-off against the sprites is more colour. The screen of the C16 can have 128 colours (121 excluding black) made up of 16 colours, B luminence levels, and flashing. Screen size is 40 x 25 text with four other graphics modes. The other graphics modes are 320 x 200 with the previously mentioned 128 colours being used in a colour map system, and 160 x 200 in a multicolour form. Both hi-res screens have an option to leave four text lines at the bottom of the screen. There are some other graphics modes and options but these are only available by POKEing. UDGs are obtained by POKEing and manipulation of registers.

The manual gives no hint of these although they are very straightforward to obtain. When playing with UDGs one other feature becomes apparent. A character generator is 2K long (256 x 8 bytes), the C16 one is only 1K long. How come? Well, the long and short of it is that the C16 uses a hardware reverse field attribute. The top bit of the current character displayed indicates whether it is inverted or not. The advantage of this lies in memory consumption. The disadvantages are that you can only have 128 UDGs, and flashing works in a rather strange way. A reverse field space is shown as a black square; when you flash it instead of getting a flashing square nothing happens. This is quite confusing until you

JOY 0
JOY 1
RESET
OFF ON
POWER

realise that a flashing space doesn't change.

Other modes not documented include Extended Background Colour mode, which gives you different background colours as well as foreground colours, and multicolour characters where each character can be made up out of a number of colours. There may be others but, without a technical manual, I cannot ascertain them.

Programming the C16

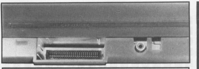
While investigating the ROM in the machine I came across a strange quirk. Before getting the manual, I was PEEKing the top end of ROM to discover the BASIC keywords. Doing this produced garbage and not the codes that I was expecting. However, entering the monitor and interrogating .memory revealed them: all the memory paging systems of the Plus 4 have been left in, so when you try to PEEK the ROM the BASIC pages it out to allow access to the RAM beneath. This is alright in a 64K Plus 4 but in a 16K C16 there is no memory there — just garbage.

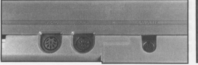
This brings me onto another point. The BASIC (covered in the latter half of this article) is ideal for an inexperienced user or an experienced BASIC user, but what about us machine code hacks and people that wouldn't use BASIC if they were paid to?

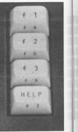
The answer is TEDMON — a full feature assembler, disassembler, monitor, debugger. It is similar to Extramon 7.5 and is very good indeed. This makes writing assembly language very easy as you already have most of the development software built in.

Here is a list of monitor commands.

A	ASSEMBLE	Assemble a line of 6502 code
C	COMPARE	Compare two sections of memory and report differences
D	DISASSEMBLE	Disassemble a line of 6502 code
F	FILL	Fill memory with the specified byte
G	GO	Start execution at the specified address
H	HUNT	Hunt through memory for all occurrences of certain bytes
L	LOAD	Load a file from tape or disk
M	MEMORY	Display the hexadecimal values of memory locations
R	REGISTERS	Display the 6502 Registers
S	SAVE	Save to tape or disk
T	TRANSFER	Transfer code from one section of memory to another
X	EXIT	eXit TEDMON







The monitor can also be called by using the reset button. This is a great feature and is in a little recess just by the power supply. Press it in and the machine goes back to its power on state — memory contents are preserved but it is awkward to get at them. The beauty of it all comes when you keep the STOP key pressed down at the same time as you press in the reset key: the computer jumps into the monitor, key in 'X' (for eXit) and you are back in BASIC, complete with intact program.

BASIC on the 16

Commodore BASIC has been around in one form or another since the early PET in the mid 70's; little has happened to it since then. In the outside world fancy, structured BASICS have been the order of the day. BBC and QL BASIC are so far removed from the original Dartmouth BASIC that they can hardly be called BASIC at all. The Commodore 16 is the first major departure from the standard Commodore BASIC. The 64 and VIC use BASIC 2.0, the business machines use BASIC 4.0, The Commodore 16's BASIC 3.5 does not really fall between the two but goes beyond BASIC 4.0. It incorporates most of the features of BASIC 4.0 and adds many new graphics and sounds commands. The only command which is missing from BASIC 3.5 but is present in BASIC 4.0 is RECORD. RECORD aids the accessing of data in a random access file; this omission is a shame because random access files open up (no pun intended) great scope for business programming. They can still be implemented but sending bytes off one at a time is a little laborious.

There are lots of new commands in BASIC 3.5, some replace the POKEing required on the Commodore 64 and some add extra functions. They divide up into five main sections: structure, toolkit, disc handling, graphics and sound.

Structure

The IF..THEN structure has finally sprouted an ELSE tag. Most Commodore programmers fail to see the value of this, after all you can always put the next statement on the following line. Where ELSE really comes into its own is in conjunction with a GOSUB. Consider this routine:

```
10 IF Z =1 THEN GOSUB 100
ELSE GOSUB 200
20 PRINT "BACK FROM THE
ROUTINE"
```

Without the ELSE it would have to look like this

```
10 IF Z=1 THEN GOSUB 100
15 IF Z<>1 THEN GOSUB 200
20 PRINT "BACK FROM THE
ROUTINE"
```

Without the test in line 15 the program would always get to 200. The ELSE function is a very valuable addition to Commodore BASIC.

Brand new structures are DO..LOOP WHILE and DO..LOOP UNTIL. These allow a FOR..NEXT type of loop where the control variable can be altered in the middle of the loop. They do of course mean that any program with the variable DO in it will not work.

Most Commodore users will be familiar with the line

```
10 GETA$:IFA$=" "THEN10
```

Which waits for a key to be pressed. Well Commodore have decided that this is so common that they have added a command GETKEY which does the same thing.

The INSTR command makes data validation much more simple, it returns the position in a string or a substring so PRINT INSTR ("NNANNN", "A") will give the answer 3. Think how useful this is for adventures, all you need is a INSTR ("NORTHSOUTHEAST WEST",D$).

To neaten up output there is the PRINT USING command, this allows you to define the shape of the output and the decimal point and pound sign are looked after by the computer. Adventure writers will appreciate the RESTORE < line number > feature and everyone will appreciate the TRAP < linenumber > command which causes the program to jump to a specified line if an error occurs. This can lead to sloppy programming but its benefits, in preventing the user of a BASIC program getting into the program when an error occurs, far outweigh the disadvantages.

Toolkit

From the early days of the PET there have been add-on toolkits for the PET. The C16 comes with one built in. Most prominent is the HELP key. When an error occurs in a program pressing the HELP key causes the line to be listed with the offending statement in a multi-statement line flashing. The VIC and 64 have always required a machine code patch to allow them to use the function keys on the left hand side. The C16 has a KEY command. Just typing KEY produces a list of the key definitions on the screen. KEY followed by a number and a string allocates that string to the key specified by the number. Even the HELP key can be redefined.

An AUTO command provides automatic line numbering. It works in an odd fashion, you have to type AUTO and then the increment. Then you start entering the program with a line number and then all the subsequent line numbers are generated for you. The AUTO command is not quite fast enough and can't keep up with a key defined with a message and a carriage return. The AUTO mode is switched off by hitting return over a blank line.

The RENUMBER command neatens up programs and allows forgetful program-mers to squeeze in that essential bit of code which was missed out. Unlike the dreadful renumber in Simons BASIC this one works properly and renumbers GOTOs and GOSUB's.

The toolkit for the old PETs had a great TRACE function. This gave the line that was being executed and the last few lines above that in a window. The C16 just prints out the line being executed at the current print position. This means that the screen gets cluttered with a load of line numbers and cannot see what is supposed to be going on. It is switched on with TRON and off with TROFF.

Disc handling

BASIC 4.0 programmers will be familiar with all these commands.

BACKUP provides a fast backup between drives on a dual drive unit. The only way of using this is with a 4040/8050 type drive and an interpod since the 1542 is only a single drive. There may be a dual drive in the pipeline; one was pictured in Commodore's report to shareholders.

DIRECTORY shows the contents of a disc without destroying any BASIC program in memory. There is no CATALOG command as used in BASIC 4.0.

DLOAD and DSAVE load and save files from and to disc. HEADER formats a new disc; there are two ways of doing this, a full HEADER which formats the whole disc and a quick HEADER which just formats over the directory on a disc which has already been used. The former is probably safer since it ensures the whole disc is safe to use and there are no bad sectors. RENAME does just that; it allows the name of a file to be changed on the disc, ideal for archiving a file you are working on.

COPY is slower than backup for copying a whole disc and does not format the disc it is copying onto but will copy one or a selection of files.

Overall, the disc handling commands are a very useful addition — for disc users — but how many people will spend £230 on a disc drive for a £140 computer remains to be seen.

Graphics

By far the greatest improvements in Commodore BASIC have occurred in the field of graphic commands. The use of high resolution graphics really clobbers the memory, in high res mode the user is left with 2K to work with. Clever machine code could eek this out but most users will want to use BASIC.

The non-high res command is COLOUR. This replaces all the messy POKEing. There are three parameters to this command:
type, colour and brightness. The type is a number between 0 and 4:

0 — Background
1 — Character (INK)
2 — multi colour 1
3 — multi colour 2
4 — border

To use the high resolution graphics there is the GRAPHIC command. This allows for two modes, a 320 by 200 mode where the colour resolution is limited to two colours per 64 pixels and a multi colour mode which allows four colours per 64 pixels. There is an option to clear the graphic mode as you enter it. The graphic screen can be cleared with the SCNCLR command. The DRAW command will either draw from the last point or from and to a specified point. The colour can be given for each line. One of the major problems with a graphics screen is the difficulty of printing text to it. Drawing out a whole word can be very laborious. The C16 has two ways of overcoming this. The first is a text window at the bottom of the screen which can be printed to and which scrolls in the normal way. The second is the CHAR command. This either writes or erases a given string at a specified position; it is slow but allows the string to be put anywhere on the graphics screen. The BOX command is a fast alternative to using four draw commands. It is possible to produce a filled or rotated box. The CIRCLE command is a little slow but makes up for that in its flexibility; it can be used to draw any polygon or oval. Colour fill is quite difficult to write but this is no problem on the C16 which has a PAINT instruction. The 121 colours make the C16 a very pretty machine.

An attempt to mimic sprites has been made by the inclusion of the commands GSHAPE and SSHAPE. These suck graphics from the screen into a string which can then be squirted back onto a different part of the screen. There are flags for different logical operations which can be used to produce different effects when re-printing the software sprite.

Sound

Sound on the C16 is a doddle when compared to the 64. This is partly due to the new BASIC commands and partly due to the lack of facilities. There are only two commands, VOL and SOUND. There are two musical voices and one noise channel. The parameters for SOUND are the voice number, the note and the duration. It won't be long before we start to learn the standard zapping sounds.

Final points

The manual is excellent and way past Commodore's usual standard. It is informative and instructional for the first time user. For the experienced person there are memory maps and register details.

At only 16K the C16 looks a bit on the slim side, especially as the system cust out 4K for the operating system and screen. This leaves you with 12K for programs. This is not too bad considering that Commodore machines are very frugal with memory consumption.

Finally, another 10K disappears when using hi-res graphics, thus leaving only 2K for the user. Through clever programming, an extra 2K can be extracted from the machine making a grand total of 4K!!!

All we can hope for is that memory expansion units become available as soon as possible, if not from Commodore then from third party manufacturers.

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THE BASIC FACTS PT. 3

Getting into a loop over BASIC? Then follow A P and D J Stephenson's advice on conditional processes and loops in the third part of this series.

THE POPULAR PRESS IS fond of implying that computers, in some way or another, have electronic 'brains' and that they work things out for us. This is typical media rubbish. Computers don't know how to work anything out. They do exactly what they are told and nothing else. If a human doesn't know how to solve a problem then no computer, however much it weighs or costs, can solve it. Naturally, every problem could, in theory, eventually be solved by some form of trial and error process but this is not really solving the problem — it is just laboriously eliminating the methods which won't solve it! Fortunately, the computer works so much faster than humans that even trial and error methods are often practical, even if it involves working through millions of incorrect answers before they hit, by chance, on the right one. Perhaps it is this which is partly responsible for the myth that computers have 'intelligence'. Nevertheless, there is one statement in the BASIC vocabulary which, superficially, appears to imbue the computer with some intelligence. This is the IF/THEN statement because it appears that the computer is capable of making a *decision*. (In reality, the computer doesn't make the decision at all but it seems as if it does). The format of the IF statement is as follows, IF *condition* THEN *action*.

Example:
```
IF A = 20 THEN 110
```
The condition is 'if A = 20'

The action implies 'GOTO line 110 for the next instruction' Whether the action is carried out or not depends entirely on the truth or falsity of the condition. If it is *true*, the action after the THEN part is obeyed. If *false*, the action is ignored and the program continues with the next line number following the IF statement. In the example above, if A was indeed 20, the computer would go to line 110, but if it was not 20, the program would simply carry on to the next line instead of jumping to 110. It is important to point out that the particular action to be executed if the condition is true is not necessarily a simple jump to a line number. Here are some examples of legitimate IF statements:

```
IF A > = 25 THEN X = X+1
```

IF the condition is true, the action is a simple increment action on X.

```
IF BF >   K*(B+3) THEN BF =
K*(BF+3)
IF A = 30 GOTO 236
```

(Notice here that the word THEN can be missed out and replaced by GOTO if the action is a jump to line number)

```
IF DS = K THEN Z = Z+3:PRINT
DS
```

Notice here that the action can be extended to *more than one statement* providing the usual colon delimiter is used to separate them. The rule is that all statements which follow the THEN part and which belong to the *same* line number are executed if the condition is true. If the condition is false, none of them are executed and the program continues at the next line number.

It is clear from all this that although the IF statement appears to make a decision, it is not a decision in the intellectual sense. A true decision is based on a judgement formed after considering the relative merits of alternative solutions to a problem. The computer is not making a decision at all. It has no option but to act on the value of a variable so it is still a moron, behaving according to directions given by human intelligence.

We are promised that the next breed of computers now on the drawing board, will usher in the so-called fifth generation revolution. These are said to have artificial intelligence built into them. It remains to be seen whether this is true intelligence or merely an increase in memory processing ability. In the meantime it is comforting to rely on the following definition: 'Intelligence is that which a computer does not have'.

It will at least preserve man's dignity for a bit longer.

Repetition

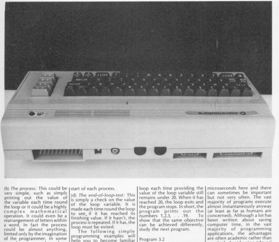
A computer is ideally suited to carry out repetitive tasks. That is to say, an identical process is carried out on a variable, for a certain number of times. Although the process is identical, it is clear that something must change during each repetition or nothing much would be achieved. The following terms, relating to repetitive tasks, are well standardised.

(a) *Loop:* the general name for value, 26 is the finishing value
(b) *Cycle:* one complete process.
(c) *The Loop Variable:* the particular variable which is changed during each cycle.
(d) *The increment*: the amount by which the loop is variable is changed each time. It can be either positive or negative. For example, the increment could be +3, meaning the variable is increased by 3 or –3, meaning the variable is decreased by 3, within each cycle.
(e) *The starting value:* this is the value given to the variable on entering the loop.
(f) *The finishing value:* the final value required of the loop variable. When the loop variable has reached this value, the repetitive process is complete and the program is arranged to come out of the loop.

As an example, to illustrate the meaning of these terms, suppose we want the variable A to grow, one at a time, from 5 to 26 within a loop, then A is the loop variable, 5 is the starting value,. 26 is the finishing value and the increment is +1. As a further example, suppose B 1 is to diminish from 300 to 200 by increments of 5. The loop variable is B1, the starting value is 300, the finishing value is 200 and the increment is –5.

Components of a loop

Bearing in mind the points raised above, a loop will consist of the following components:
(a) *Initialisation*: Preparing the loop for entering the loop. This will often be no more than a simple assignment for setting the starting value of the loop variable.



(b) *The process:* This could be very simple, such as simply printing out the value of the variable each time round the loop or it could be a highly complex mathematical operation. It could even be a rearrangement of letters within a word. In fact the process could be almost anything, limited only by the imagination of the programmer. In some cases, loops are used merely to cause a delay somewhere within a program. For example, to display a screen message for just sufficient time for the operator to read it and decide the appropriate action. In such cases, the actual process is quite unimportant providing the execution time is judged to be equal to the required delay. It should be mentioned however that using a loop for inserting a delay is not to be recommended. It is crude and, unless you know the execution time of the statements which form the process, is little more than a trial and error exercise.
(c) *The incrementation:* The loop variable must be altered in some way ready for the next cycle. There is no hard and fast rule as to the position of the incrementing procedure. Sometimes it may be advantageous to increment before and sometimes after the start of each process.
(d) *The end-of-loop-test:* This is simply a check on the value of the loop variable. It is made each time round the loop to see if it has reached its finishing value. If it hasn't, the process is repeated. If it has, the loop must be exited.

The following simple programming examples will help you to become familiar with the terms,

```
Program 3.1
100 A=1
110 PRINT A
120 A=A+1
130 IF A > 20 GOTO 110
140 END
```

No apologies are made for the childish simplicity of the program. It is quite good enough to illustrate most of the points already made. The loop extends over the lines 110 to 130. Line 100 initialises the loop variable by a simple assignment statement. The process is simply to print out the value of A each time round. Line 120 deals with the incrementation of the loop variable, the increment being + 1 each time. Line 130 handles the end-of-loop test by diverting the program back to the start of the loop each time providing the value of the loop variable still remains under 20. When it has reached 20, the loop exits and the program stops. In short, the program prints out the numbers 1,2,3, . . .19. To show that the same objective can be achieved differently, study the next program.

```
Program 3.2
100 A=-1
110 A=A+1
120 PRINT A
130 IF A 20 GOTO 110
140 END
```

This time, the incrementation has been carried out before the process but, to satisfy the same objective, the loop variable is initialised to -1. It may be asked, 'Which is the best way?' There is no straightforward answer to this since situations can arise where the second version is more convenient. However, the first version is easier to follow. It is more 'logical'. Indeed, we can lay down the general rule that if there is more than one way of achieving the same result, always choose the one which is easier to follow, even if it happens to be a little less efficient and takes a longer time to execute. Saving a few microseconds here and there can sometimes be important but not very often. The vast majority of programs execute almost instantaneously anyway (at least as far as humans are concerned). Although a lot has been written about saving computer time, in the vast majority of programming applications, the advantages are often academic rather than practical. Avoid using 'clever' tricks just to show you are clever. You may earn the temporary admiration of a few neophytes but not for long. The watchword of good structure is clarity.

Bugs in loops

When programming a loop, there are two areas in which bugs delight to lurk.
(a) *Incorrect number of loops:* It is very easy to be 'one out' in the loop count. For instance, in both Programs 3.1 and 3.2, it is quite possible that the original intention was to print out the value of A from 1 to 20 instead of to 19. The error, responsible for an incorrect loop count, can lie in either the initialisation or the end-of-loop test.

(b) *The endless loop:* It is easy, in fact ridiculously easy, to fall into the endless loop trap. Instead of revolving round a certain number of times, the loop goes on for ever. In other words, the program is locked within the loop and can never escape to the rest of the program. The most common cause of the bug is a jump to an incorrect line. For example, in Programs 3.1 and 3.2, if the IF statement returned control to line 100 instead of 110, it should be easy to see that an endless

loop situation would exist because the effective increment is cancelled by re-initialisation each time. It would also happen if the end-of-loop test was searching for a number which could never be reached. For example, if we had written

```
100 IF A     -20 GOTO 100
```

it is evident that this value of A would never be reached so an endless loop would be created. If the increment is positive and the starting value is greater than the finishing value, you have an endless loop. An endless loop will also arise if the increment is negative and the starting value is less than the finishing value. Unfortunately, the cure of loop bugs is not always so easy to spot. If the loop is at all complex, it may require a good deal of detective work and the occasional bout of cursing before the cure is found. Very often, curing one fault initiates another, particularly if you have been careless with regard to structure.

The FOR/NEXT loop method

Although the previous method of organising a loop is quite satisfactory, the designers of BASIC were kind enough to provide us with a pair of statements which were intended to make life a lot easier. The FOR statement is used at the start of the loop and the NEXT statement marks the end of the loop. The process is in the middle. Although the Commodore User Manual describes the use of the FOR/NEXT loop structure, we will start from scratch in order to amplify some of the points made. The format of the FOR statement is as follows,

FOR *variable = starting v alue* TO *finishing value* STEP *increment*

For example,

```
FOR A = 1 TO 20 STEP 1
```

This will head a loop in which A will start at 1 and carry on until it reaches a value of 20, incrementing by 1 each time round the loop. The bottom of the loop is defined by the simple statement,

```
NEXT A
```

Note that the FOR statement does quite a lot. It combines the role of initialisation, incrementation and, surprisingly, end-of-loop test all in one go. To illustrate the elegance of the FOR loop and to see how it compares with previous work, study the following:

```
Program 3.3
100 FOR A = 1 TO 19 STEP 1
110 PRINT A
120 NEXT A
```

This will produce identical results to the previous two programs — it prints out the value of A from 1 to 19 inclusive. It does not require the addition of the IF statement to terminate the loop. Also, it is inclined to be less error prone because it reduces the chance of being one out in the loop count.

It is important to be aware of the following features:

1. Whatever the parameters in the FOR statement, the loop will always process through once.
2. The value of the loop variable after exiting the loop will always be one increment more than the finishing value. For example, in Program 3.3, although only the numbers 1 to 19 are printed out, the value of A after exit will be 20.
3. If the increment is to be +1, it is not necessary to include STEP 1. Thus, the FOR statement in Program 3.3 could have been written in the more concise form,
```
100 FOR A = 1 TO 19
```
4. The loop variable must be *floating point*. We can't write FOR A% etc.
5. The starting, finishing and increment values can be variable names or any legitimate expression. For example, the following FOR statements are all legal:

```
FOR A = B TO C STEP D
FOR B1 = B+C-3 TO 5★D
STEP E/3
FOR C = B*SIN(K) TO
26★TAN(T) STEP 1/COS (K)
FOR D = 26 TO 5 STEP -0.1
FOR K = 26 TO 5 STEP 1
```

The last example is, of course, absurd but has been included to press home that even here, the loop will execute at least once.

6. NEXT A can be abbreviated to NEXT because there is no need to specify the variable although some think it is tidier.

Loop objectives

To consolidate some of the previous material, here are some loop problems and possible solutions:

1. A loop which prints out a table of the square roots of the odd integers from 1 to 17.

```
Program 3.4
100 PRINT CHR$(147):
REM CLEAR SCREEN
110 FOR I = 1 TO 17 STEP 2
120 PRINT SQR(I)
130 NEXT
140 END
```

Line 100 clears the screen. It is a cleaner method than the ponderous PRINT "CLR/HOME)"

2. A loop which prints out all integers between 5 and 24 except 17

```
Program 3.5
100 PRINT CHR$(147)
110 FOR I = 5 to 24
120 IF I >    17 PRINT I
130 NEXT
```

3. A loop which prints out the sum of all integers from 1 to 10000

```
100 PRINT CHR$(147)
110 S = 0:REM S IS TO
HOLD THE SUM
120 FOR I = 1 TO 1000
130 S = S+I
140 NEXT
150 PRINT S
160 END
```

Two points here. The program takes a little while so just wait patiently. We are aware of the simple formula for summing integers but this section is about loops.

Nesting loops

It is possible to have a loop inside a loop and indeed, one inside that, and so on. Such combinations are called loop nests. There is a limit to the number of nests but it is too large to worry about in practical programming at our level. Here is an example of a simple nested loop.

```
Program 3.6
100 PRINT CHR$(147)
110 FOR A = 1 TO 10
120 FOR B = 2 TO 10
130 PRINT A*B
140 NEXT
150 PRINT
160 NEXT
160 END
```

The *inner loop* is between lines 120 to 140 inclusive. The inner loop first revolves with the value of A fixed at 1 whilst the value of B goes from 2 to 10. The value of A then remains fixed at 2 while the value of B again goes from 2 to 10. This process continues until the value of the outer loop variable has reached 10. Since the process within the inner loop is simple multiplication of A times B, we are in effect printing out a set of multiplication tables. The PRINT line provides demarcation between the outer loop limits.

Finally, we should explain that no attempt has been made in any of our programming examples to portray a nice screen appearance or to use literal messages. These will come later. Such niceties tend, in the early stages anyway, to obscure essential points. Loops are so important that nothing must stand in the way whilst they are explained. Soon, we hope, they will become second nature to you.

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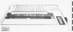

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Les Allan's fast load utility should stop you nodding-off while waiting for your favourite programs to load.

TURBO 64

187469

65536
18218
47318
2048
45270

2048 - 47318

This utility, when completed, exists as a machine code file booted from basic to $C999 and remains in residence to perform the following:

SYS 49152	text mode to prompt available functions
SYS 50000	activate Turbo 64
SYS 50700	save relevant section of memory to tape

Turbo 64 commands are as follows:

← L	this will load, at turbo baud rate, the 1st file from tape
← L" "	this will load a namefile from tape
← L" ",1,1	this will load, to the area of memory saved, a M/C file
← S	this will save, at turbo baud rate, a program without a name
← S" "	this will save a program with a name
← S" ",1,1	this will save a M/C file to tape from the area resident in memory
← V	this will verify the 1st file on tape
← V" "	this will verify a program with a name

Program details

The program as listed must be typed in exactly as written and saved prior to running. Error trap routines are included to ensure that the data is within the required limits and of the correct value and quantity. The program when run stores the relevant data at a temporary address at $8000 and when actioned transfers the data to the start of BASIC as a M/C file for the finished product. At this point the program when listed has overwritten the 'BASIC boot' and exists as a single line number 10 SYS 2064. The prompt on the screen is the M/C routine to save the finished product by pressing RECORD and PLAY on the tape.

When the finished program is loaded and run the M/C routine transfers the data to $C000 and will remain available for use by the programmer to load, save and verify at Turbo baud rate — 10 times normal speed.

1.	Load"T 64",1,1	load turbo to memory
2.	SYS 64738	COLD start
3.	SYS 50000	activate turbo
4.	←L" "	load program
5.	RUN	

figure 1

Turbo save routine

A save routine exists within the utility to enable the turbo routine to be used as a header for turbo saved programs. This is accessed by the command SYS 50700 and, when the prompt appears on the screen, the routine is saved by pressing RECORD and PLAY on the tape. The turbo routine is then saved to tape between $C350 and $C608.

This can then be used to load turbo saved programs as in figure 1.

M/C files can be loaded by using a BASIC header as follows

10 IF A=0 THEN A=1:LOAD"T 64",1,1
20 IF A=1 THEN A=2:SYS 50000
30 IF A=2 THEN A=3:←L"",1,1

The routine accessed by SYS 50700 should then be appended to the BASIC boot followed by the turbo saved program.

N.B.

Whereas the Commodore Logo key is used to commence the load routine for normal useage the turbo routine requires the use of the SPACE BAR to start the load sequence.

This utility can and has been used to successfully transfer many commercial programs but information on such matters is strictly confidential and outside the scope of this article. Suffice it to say that material that would normally take 15 min to load will take a mere 1.5min with this utility.

Program Listing

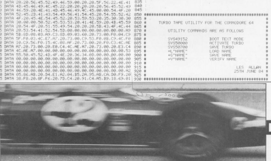
```
10 REM ##### TURBO TAPE UTILITY FOR COMMODORE  64 #####
15 :
20 POKE53280,0:POKE53281,0
25 PRINTCHR$(147)CHR$(5)SPC(12)"%%% TURBO 64 %%%"
30 PRINT:PRINT
35 PRINT"THIS BASIC  PART  OF THE  PROGRAM STORES"
40 PRINT"THE TURBO ROUTINE AT A TEMPORARY ADDRESS"
45 PRINT"OF 32768 [$8000] IN ORDER TO ENABLE  THE"
50 PRINT"FINISHED PROGRAM  TO  BE  TRANSFERRED TO"
55 PRINT"THE START OF  BASIC AND SAVED AS MACHINE"
60 PRINT"CODE WITHOUT THE NEED  TO  USE A MONITOR"
65 PRINT
70 PRINTSPC(3)CHR$(129)"!!! WARNING !!!    !!! WARNING !!!"
75 PRINT:PRINTCHR$(28)
80 PRINT"THIS PROGRAM MUST  BE  SAVED  AS THE M/C"
85 PRINT"ROUTINE USED WILL OVERWRITE THIS PROGRAM"
90 :
95 REM ################## HEX LOADER ##################
100 :
105 INC=0:SUM=0
110 READDA$:IFDA$="END"THEN170
115 IFLEN(DA$)<>2ANDDA$<>"END"THEN210
120 H=ASC(LEFT$(DA$,1)):H1=(H-48)*16:IFH>57THENH1=(H-55)*16
125 H=ASC(RIGHT$(DA$,1)):H2=(H-48):IFH>57THENH2=(H-55)
130 BCD=H1+H2:IFBCD<0ORBCD>255THEN210
135 POKE32768+INC,BCD:INC=INC+1:SUM=SUM+BCD
140 PRINT:PRINTCHR$(5)SPC(5)"DATUM LEFT FOR TRANSFER :";
145 PRINT1920-INCCHR$(157)CHR$(32)CHR$(145)CHR$(145)
150 GOTO110
155 :
160 REM ################## SAVE ROUTINE ##################
165 :
170 IFINC<>1920ORSUM<>187476THEN210
175 PRINTCHR$(147)"DATA TRANSFER COMPLETE"
180 PRINT:PRINT:PRINT"HAVE YOU SAVED THIS PROGRAM ??"
185 GETKEY$:IFKEY$<>"Y"ANDKEY$<>"N"THEN185
190 IFKEY$="Y"THENSYS34560:END
195 PRINTCHR$(17)CHR$(17)"SAVE"CHR$(34)"TURBO BOOT"CHR$(34)
200 PRINTCHR$(145)CHR$(145)CHR$(145)CHR$(145)
205 END
210 PRINTCHR$(147)"ERROR IN DATA STATEMENT !!!":STOP
215 :
220 REM ########### HEX DATA FOR M/C ROUTINE ###########
```

187476
187469

50769 50696

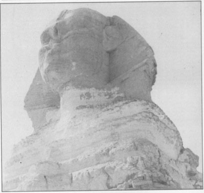
EA

```
225 :
230 DATA 0B,08,0A,00,9E,32,30,36,34,00,00,00,AA,AA,AA,A9
235 DATA E0,8D,A9,02,A2,00,BD,50,08,9D,00,C0,BD,30,09,9D
240 DATA E0,C0,BD,10,0A,9D,C0,C1,BD,F0,0A,9D,A0,C2,BD,D0
245 DATA 0B,9D,80,C3,BD,B0,0C,9D,60,C4,BD,90,0D,9D,40,C5
250 DATA BD,70,0E,9D,20,C6,E8,EC,A9,02,D0,CA,4C,00,C0,20
255 DATA CC,FF,A9,AA,8D,A7,02,A2,01,8D,A8,02,20,44,E5,A9
260 DATA 0E,8D,20,D0,A9,03,8D,21,D0,18,AE,A8,02,A0,04,20
265 DATA F0,FF,A9,06,8D,86,02,AE,A7,02,BD,C0,C0,F0,07,20
270 DATA D2,FF,E8,4C,2B,C0,EE,A8,02,E8,8E,A7,02,A9,08,CD
275 DATA A8,02,F0,03,4C,1A,C0,EE,A8,02,EE,A8,02,A9,00,8D
280 DATA A7,02,A9,0E,8D,86,02,18,AE,A8,02,A0,02,20,F0,FF
285 DATA AE,A7,02,BD,C0,C1,F0,07,20,D2,FF,E8,4C,64,C0,EE
290 DATA A8,02,E8,8E,A7,02,A9,12,CD,A8,02,F0,03,4C,58,C0
295 DATA A2,00,8E,A7,02,18,AE,A8,02,A0,02,20,F0,FF,AE,A7
300 DATA 02,BD,C0,C2,F0,07,20,D2,FF,E8,4C,92,C0,EE,A8,02
305 DATA E8,8E,A7,02,A9,19,CD,A8,02,F0,03,4C,86,C0,A9,00
310 DATA 85,C6,20,E4,FF,C9,00,F0,F9,4C,94,E3,AA,AA,AA,8E
315 DATA 08,12,75,60,60,60,60,60,60,60,60,60,60,60,60,60
320 DATA 60,60,60,60,60,60,60,60,60,60,60,60,60,60,60,60
325 DATA 60,69,00,7D,20,60,B2,60,20,B2,20,B2,20,B0,60,69
330 DATA 20,B0,60,69,20,75,60,69,20,20,75,60,69,20,B2,20
335 DATA 20,20,7D,00,7D,20,20,7D,20,20,7D,20,7D,20,7D,20
340 DATA 7D,20,7D,20,7D,20,7D,20,7D,20,20,7D,20,20,20,7D
345 DATA 20,B2,20,7D,00,7D,20,20,7D,20,20,7D,20,7D,20,AB
350 DATA B2,6B,20,AB,60,B3,20,7D,20,7D,20,20,AB,60,69,20
355 DATA AD,60,7B,20,7D,00,7D,20,20,7D,20,20,7D,20,7D,20
360 DATA 7D,7D,20,20,7D,20,7D,20,7D,20,7D,20,20,7D,20,7D
365 DATA 20,20,20,7D,20,7D,00,7D,20,20,B1,20,20,6A,60,6B
370 DATA 20,B1,AD,20,20,AD,60,6B,20,6A,60,6B,20,20,6A,60
375 DATA 6B,20,20,20,B1,20,7D,00,6A,60,60,60,60,60,60,60
380 DATA 60,60,60,60,60,60,60,60,60,60,60,60,60,60,60,60
385 DATA 60,60,60,60,60,60,60,6B,92,00,00,00,00,00,00,00
390 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,54
395 DATA 48,49,53,20,55,54,49,4C,49,54,59,20,45,4E,41,42
400 DATA 4C,45,53,20,50,52,4F,47,52,41,4D,53,20,54,4F,20
405 DATA 20,42,45,00,4C,4F,41,44,45,44,2C,53,41,56,45,44
410 DATA 20,26,20,56,45,52,49,46,49,45,44,20,41,54,20,54
415 DATA 45,4E,20,54,49,4D,45,53,00,4E,4F,52,4D,41,4C,20
420 DATA 20,42,41,55,44,20,20,52,41,54,45,20,20,42,59,20
425 DATA 54,48,45,20,46,4F,4C,4C,4F,57,49,4E,47,00,00,20
430 DATA 20,5F,4C,20,20,20,20,20,20,20,20,20,20,20,20,20
435 DATA 20,20,4C,4F,41,44,20,20,20,31,53,54,20,46,49,4C
440 DATA 45,00,20,20,5F,4C,22,4E,41,4D,45,46,49,4C,45,22
445 DATA 20,20,20,20,20,4C,4F,41,44,20,20,20,4E,41,4D,45
450 DATA 46,49,4C,45,00,20,20,5F,53,20,20,20,20,20,20,20
455 DATA 20,20,20,20,20,20,20,20,53,41,56,45,20,20,00,20
460 DATA 20,5F,53,22,4E,41,4D,45,46,49,4C,45,22,20,20,20
465 DATA 20,20,53,41,56,45,20,20,20,4E,41,4D,45,46,49,4C
470 DATA 45,00,00,00,00,00,00,00,00,00,00,00,00,00,00,20
475 DATA 20,5F,56,20,20,20,20,20,20,20,20,20,20,20,20,20
480 DATA 20,20,56,45,52,49,46,59,00,20,20,5F,56,22,4E,41
485 DATA 4D,45,46,49,4C,45,22,20,20,20,20,20,56,45,52,49
490 DATA 46,59,20,4E,41,4D,45,46,49,4C,45,00,00,54,4F,20
495 DATA 52,45,2D,41,43,54,49,56,41,54,45,20,54,55,52,42
500 DATA 4F,20,45,4E,54,45,52,20,53,59,53,20,35,30,30,30
505 DATA 30,00,00,50,52,45,53,53,20,41,4E,59,20,4B,45,59
510 DATA 20,54,4F,20,51,55,49,54,20,20,20,5B,43,4F,4C,44
515 DATA 20,53,54,41,52,54,5D,00,00,00,00,00,00,00,00,A9
520 DATA 5B,8D,08,03,A9,C3,8D,09,03,60,20,73,00,F0,04,C9
525 DATA 5F,F0,03,4C,E7,A7,20,73,00,C9,53,F0,0B,C9,4C,F0
530 DATA 10,C9,56,F0,15,4C,08,AF,20,73,00,20,F0,C3,4C,AE
535 DATA A7,20,73,00,20,E0,C4,4C,AE,A7,20,73,00,20,E3,C4
540 DATA 4C,AE,A7,00,00,00,00,00,00,00,00,00,00,00,00,53
545 DATA 55,50,45,52,4D,4F,4E,20,36,34,0D,00,00,00,00,00
550 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
555 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
560 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
565 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,A2
570 DATA 05,86,AB,20,D4,E1,A2,04,B5,2A,95,AB,CA,D0,F9,20
575 DATA 38,F8,20,8F,F6,20,7D,C4,20,91,C4,A5,B9,18,69,01
580 DATA CA,20,B1,C4,A2,08,B9,AC,00,20,B1,C4,A2,06,C8,C0
585 DATA A5,FA,DA,F2,AA,A0,A2,04,B1,BB,C4,B7,90,03,A9,20
590 DATA CA,20,B1,C4,A2,05,C8,C0,BB,D0,ED,A9,02,85,AB,20
595 DATA 91,C4,98,20,B1,C4,84,D7,A2,07,EA,B1,AC,20,B1,C4
600 DATA A2,03,E6,AC,D0,04,E6,AD,CA,CA,A5,AC,C5,AE,A5,AD
605 DATA E5,AF,90,E7,EA,A5,D7,20,B1,C4,A2,07,88,D0,F6,C8
610 DATA 84,C0,58,18,A9,00,8D,A0,02,4C,93,FC,A0,00,84,C0
615 DATA AD,11,D0,29,EF,8D,11,D0,CA,D0,FD,88,D0,FA,78,60
620 DATA A0,00,A9,02,20,B1,C4,A2,07,88,C0,09,D0,F4,A2,05
625 DATA C6,AB,D0,EE,98,20,B1,C4,A2,07,88,D0,F7,CA,CA,60
630 DATA 85,BD,45,D7,85,D7,A9,08,85,A3,06,BD,A5,01,29,F7
635 DATA 20,D3,C4,A2,11,EA,09,08,20,D3,C4,A2,0E,C6,A3,D0
640 DATA E9,60,CA,D0,FD,90,05,A2,0B,CA,D0,FD,85,01,60,A2
645 DATA 00,2C,A2,01,A4,2B,A5,2C,86,0A,86,93,84,C3,85,C4
650 DATA 20,D4,E1,20,FD,C4,20,7A,E1,4C,74,A4,20,61,C5,A5
655 DATA AB,C9,02,F0,08,C9,01,D0,F3,A5,B9,F0,0A,AD,3C,03
660 DATA 85,C3,AD,3D,03,85,C4,20,50,F7,20,E4,FF,F0,FB,20
665 DATA 2C,A8,A4,B7,F0,0B,88,B1,BB,D9,41,03,D0,CE,98,D0
670 DATA F5,84,90,20,D2,F5,AD,3E,03,38,ED,3C,03,08,18,65
675 DATA C3,85,AE,AD,3F,03,65,C4,28,ED,3D,03,85,AF,20,76
680 DATA C5,A5,BD,45,D7,05,90,F0,04,A9,FF,85,90,4C,A9,F5
685 DATA 20,AF,C5,C9,00,F0,F9,85,AB,20,DD,C5,91,B2,C8,C0
690 DATA C0,D0,F6,F0,2D,20,AF,C5,20,DD,C5,C4,93,D0,02,91
695 DATA C3,D1,C3,F0,02,86,90,45,D7,85,D7,E6,C3,D0,02,E6
700 DATA C4,A5,C3,C5,AE,A5,C4,E5,AF,90,DD,20,DD,C5,20,7D
705 DATA C4,C8,84,C0,58,18,A9,00,8D,A0,02,4C,93,FC,20,17
710 DATA F8,20,7D,C4,84,D7,A9,07,8D,06,DD,A2,01,20,F0,C5
715 DATA 26,BD,A5,BD,C9,02,D0,F5,A0,09,20,DD,C5,C9,02,F0
720 DATA F9,C4,BD,D0,E8,20,DD,C5,88,D0,F6,60,A9,08,85,A3
725 DATA 20,F0,C5,26,BD,EA,EA,EA,C6,A3,D0,F4,A5,BD,60,A9
730 DATA 10,2C,0D,DC,F0,FB,AD,0D,DD,8E,07,DD,48,A9,19,8D
735 DATA 0F,DD,68,4A,4A,60,00,00,00,00,00,20,44,E5,A2,00
740 DATA BD,2F,C6,F0,07,20,D2,FF,E8,4C,11,C6,A9,02,85,C6
745 DATA A9,13,8D,77,02,A9,0D,8D,78,02,6C,02,03,AA,05,11
750 DATA 53,59,53,35,30,37,36,39,2C,35,30,30,30,30,2C,35
755 DATA 30,36,39,36,2C,22,54,20,36,34,22,2C,30,31,13,00
760 DATA A5,2B,85,57,A5,2C,85,58,A5,2D,85,59,A5,2E,85,5A
765 DATA 20,FD,AE,20,8A,AD,20,F7,B7,A5,14,85,2B,A5,15,85
770 DATA 2C,20,FD,AE,20,8A,AD,20,F7,B7,A5,14,85,2D,A5,15
775 DATA 85,2E,20,FD,AE,20,56,E1,A5,57,85,2B,A5,58,85,2C
780 DATA A5,59,85,2D,A5,5A,85,2E,60,AA,AA,AA,AA,AA,AA,AA
785 DATA AA,AA,AA,AA,AA,AA,AA,AA,AA,AA,AA,AA,AA,AA,AA,AA
790 DATA A2,00,BD,00,80,9D,01,08,BD,00,81,9D,01,09,BD,00
795 DATA 82,9D,01,0A,BD,00,83,9D,01,0B,BD,00,84,9D,01,0C
800 DATA BD,00,85,9D,01,0D,BD,00,86,9D,01,0E,E8,D0,D3,20
805 DATA 44,E5,A2,00,BD,52,87,F0,07,20,D2,FF,E8,4C,34,87
810 DATA A9,02,85,C6,A9,13,8D,77,02,A9,0D,8D,78,02,6C,02
815 DATA 03,AA,05,11,53,59,53,33,34,34,36,34,2C,32,30,34
820 DATA 39,2C,33,38,34,30,2C,22,93,05,12,20,54,55,52,42
825 DATA 4F,20,36,34,20,92,22,2C,30,31,13,00,00,00,00,00
830 DATA END
835 :
840 :
845 :
850 ###################################################
855 #                                                 #
860 #     TURBO TAPE UTILITY FOR THE COMMODORE 64     #
865 #                                                 #
870 #         UTILITY COMMANDS ARE AS FOLLOWS         #
875 #                                                 #
880 #         SYS49152        BOOT TEXT MODE          #
885 #         SYS50000        ACTIVATE TURBO          #
890 #         SYS50700        SAVE TURBO              #
895 #         ←L"NAME"        LOAD NAME               #
900 #         ←S"NAME"        SAVE NAME               #
905 #         ←V"NAME"        VERIFY NAME             #
910 #                                                 #
915 #                                     LES  ALLAN  #
920 #                                    25TH JUNE 84 #
925 #                                                 #
930 ###################################################
```



PYRAMID

Tangle with snakes, coloured balls and squares in this game from Greg Hopkins. It's all Egyptian to me!



THE AIM OF THIS GAME IS TO hop around a pyramid whilst dodging the balls which rain down from above. Beware, especially, the blue ball which will hatch into a snake after it reaches the bottom of the pyramid. The snake will chase you and can only be killed if you lure it onto one of the teleport discs situated at the side of the pyramid. Once you have landed on all of the squares on the first screen, you progress onto a new more challenging level.

You commence with three lives and gain an extra life for completing screen one and then one for alternate levels after that. To complete each screen all the squares must be turned to the colour cyan; this is achieved by landing on the squares a certain number of items, depending on the level you are on.

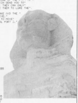
Level	Method
1	land once on each square
2	land on squares twice
3	land once but square changes back if landed on again
4	land twice — changes back to halfway stage if landed on again
5	land twice but third landing completely undoes square

Having completed level 5, you begin again at level one — but there are more balls to dodge this time round.

The game includes three-dimensional graphics and a short machine code program to move the sprites more quickly. Instructions are included in the program and control is either with a joystick or from the keyboard.

Program Listing

```
1 FORX=1TO4:POKE49494+X,0:NEXT
2 POKE53280,5:POKE53281,11
3 PRINT"▚"
5 DIMA$(34),P(20),J$(10)
8 POKE53269,0
9 GOSUB3000
10 A$(10)="          ^
20 A$(11)="         / \
30 A$(12)="         |\ /|
40 A$(13)="         |V|
45 A$(14)="         ^|^
50 A$(15)="        / V \
55 A$(16)="        |\ ^ /|
60 A$(17)="        |V|V|
65 A$(18)="        ^|^|^
70 A$(19)="       / V V \
72 A$(20)="       |\ ^ ^ /|
74 A$(21)="       |V|V|V|
76 A$(22)="       ^|^|^|^
79 A$(23)="      / V V V \
80 A$(24)="      |\ ^ ^ ^ /|_
82 A$(25)="      |V|V|V|V|
84 A$(26)="      ^|^|^|^|^
86 A$(27)="     / V V V V \
88 A$(28)="_    |\ ^ ^ ^ ^ /|
90 A$(29)="     |V|V|V|V|V|
92 A$(30)="     ^|^|^|^|^|^
93 A$(31)="    / V V V V V \
94 A$(32)="    |\ ^ ^ ^ ^ ^ /|
95 A$(33)="    |V|V|V|V|V|V|
96 A$(34)="    \|^|^|^|^|^|/
100 FORN=1TO4:GOSUB50000:NEXT
102 FORX=1TO6:POKE2040+X,15:POKE53287+X,4:NEXT
103 GOSUB55000
105 J$(0)="C":J$(8)="C":J$(1)="E":J$(2)="E"
110 J$(5)="Q":J$(9)="Q":J$(4)="Z":J$(6)="Z"
115 QX=156:QY=53:SN=7:SM=12+INT(RND(0)*8)
117 PRINT"▀▀PRESS ANY KEY TO BEGIN"
118 GETA$:IFA$=""THEN118
120 DR=3:DL=4:BM=5.9:NL=3:GOSUB2000
150 VC=54272:POKEVC+24,15
200 POKE53248+SN*2,QX:POKE53249+SN*2,QY:REM POSITION SPRITE SN
205 IFMTHENFS=1:M=M-1:GOTO255
207 IFFS=1THENGOSUB700
210 GETA$:IFA$<>""THEN220
212 A$=J$((PEEK(56320)AND15)-5)
214 IFA$=""THEN255
220 IFA$="Q"THENPOKE49422,24:PRINT"TTT▀▀";:D=D-1:R=R-1:M=7:POKE2047,14:GOTO255
230 IFA$="Z"THENPOKE49422,8:PRINT"▀▀▀▀▀";:D=D+1:M=7:POKE2047,14:GOTO255
240 IFA$="E"THENPOKE49422,17:PRINT"TTT▀▀";:D=D-1:M=7:POKE2047,13:GOTO255
250 IFA$="C"THENPOKE49422,1:PRINT"▀▀▀▀▀";:D=D+1:R=R+1:M=7:POKE2047,13:GOTO255
255 BC=BC+1
260 ONBCGOSUB330,330,350,370,400,410,430,330,450
270 A=PEEK(53278)
300 SYS12*4096+16:REM MOVE SPRITES
310 IFPEEK(53278)AND128THENGOSUB1000:REM CHECK FOR COLLISIONS
320 GOTO205
330 IFBM>=1THENBM=BM-1
332 IFRND(1)<BMTHENS$=S$+"0":MX=0:RETURN
334 IFSL$=""THENBM=BM+1:GOTO332
336 S1$=LEFT$(SL$,1):SL$=MID$(SL$,2):S$=S$+S1$:V7=VAL(S1$):R7=INT(RND(1)+.5)
337 MX=1:RETURN
338 IFMX=0THENRETURN
339 POKE53248+V7*2,140+32*R7:POKE53249+V7*2,85
340 POKE53269,PEEK(53269)OR2↑V7
342 RETURN
350 FORX=1TOLEN(S$):SP=VAL(MID$(S$,X,1))
353 IFSPTHENPOKE49408+SP*2,1+7*INT(RND(0)*2)
355 NEXT
360 RETURN
370 IFVAL(S$)>0ORSM<5THENPOKEVC+4,16:POKEVC,40:POKEVC+1,11:POKEVC+5,8
371 POKE53271,0:IFSM<-2THENPOKE53249,PEEK(53249)+21
372 SM=SM-1:IFSM=-3THENPOKE2040,192:POKE53287,5
373 IFSM<>4THENRETURN
374 POKE2040,15:POKE53287,6
376 SR=INT(RND(1)*2):SD=1
378 POKE53248,140+32*SR:POKE53249,85:POKE53269,PEEK(53269)OR1:SR=SR*2+4:RETURN
390 IFSM<-2THENPOKE53271,1:POKE53249,PEEK(53249)-21
400 RETURN
410 S1$=LEFT$(S$,1):S$=MID$(S$,2):VA=VAL(S1$)
415 IFVATHENPOKE53269,PEEK(53269)AND(255-2↑VA):SL$=SL$+S1$
420 RETURN
430 IFSM>4THENRETURN
432 IFSM>0THENRA=INT(RND(1)*2):SR=SR+1-RA*2:SD=SD+1:POKE49408,1+RA*7:RETURN
434 IFSM>-3THENRETURN
436 PV=1:IFSD>DORSD>4THENPV=PV+16:SD=SD-2
438 SD=SD+1:IFSR>4+2*R-DTHENPV=PV+7:SR=SR-2
440 SR=SR+1
442 POKE49408,PV:RETURN
450 BC=0:POKEVC+4,17:RETURN
500 PRINT"▀▀ "
505 FORX=1TO6:SYS12*4096+16:NEXT
510 FORDI=1TO3
515 BC=BC+1
530 ONBCGOSUB590,330,350,370,400,410,430,390,570,580,580,580,580,450
540 SYS12*4096+16
545 IFBC>0THEN515
550 NEXT:BC=0:FORX=0TO15:POKE49407+X,0:NEXT:S$="0000"
555 POKE53269,PEEK(53269)AND129
560 POKE53262,156:POKE53263,53:D=0:R=0:PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀";
565 BM=BM-INT(BM)+5:GOTO700
570 HV=SR*10+SD
572 IFHV=103ORHV=-6THENPOKE53269,128:SR=99:SM=INT(RND(1)*12+12):J=J+1
580 FORX=1TO20:NEXT:GETA$:RETURN
590 BM=BM+1:GOTO332
699 REM CHANGE SQUARES
700 FS=0:IFR>=0ANDR<=DTHEN708
702 IFD=DLANDR<=DTHENDL=99:GOTO500
704 IFD=DRANDR>=0THENDR=99:GOTO500
706 GOTO1000
708 PN=D*(D+1)/2+R
709 IFD>5ORD<0THEN1000
710 ONLGOTO750,800,850,900,950
750 IFP(PN)=1THENRETURN
760 PRINT"▞▜▀▀▘ ▚▀▀▀ ▞▀▀▀▜▚▜TT▀▀";:P(PN)=1
780 ND=ND+1:IFND=21THEN2000
790 RETURN
800 ONP(PN)GOTO810,820
805 PRINT"▞▜▀▀▘▞▚▀▀▀▞▚▜▀▀▀▜TT▀▀";:P(PN)=1:RETURN
810 PRINT"▞▜▀▀▘ ▚▀▀▀ ▞▀▀▀▜▚▜TT▀▀";:P(PN)=2
815 ND=ND+1:IFND=21THEN2000
817 RETURN
820 RETURN
850 ONP(PN)GOTO860,870
855 PRINT"▞▜▀▀▘▞▚▀▀▀▞▚▜▀▀▀▜TT▀▀";:P(PN)=1:RETURN
860 PRINT"▞▜▀▀▘ ▚▀▀▀ ▞▀▀▀▜▚▜TT▀▀";:P(PN)=1
865 ND=ND+1:IFND=21GOTO2000
868 RETURN
870 PRINT"^▀▀▀▀/ \▀▀▀▀ /▀▀▀▀▀\/TT▀▀";:P(PN)=0
875 ND=ND-1:RETURN
900 ONP(PN)GOTO910,920
905 PRINT"▞▜▀▀▘▞▚▀▀▀▞▚▜▀▀▀▜TT▀▀";:P(PN)=1:RETURN
910 PRINT"▞▜▀▀▘ ▚▀▀▀ ▞▀▀▀▜▚▜TT▀▀";:P(PN)=2
915 ND=ND+1:IFND=21THEN2000
917 RETURN
920 PRINT"▞▜▀▀▘▞▚▀▀▀▞▚▜▀▀▀▜TT▀▀";:P(PN)=1:ND=ND-1:RETURN
950 ONP(PN)GOTO960,970
955 PRINT"▞▜▀▀▘▞▚▀▀▀▞▚▜▀▀▀▜TT▀▀";:P(PN)=1:RETURN
960 PRINT"▞▜▀▀▘ ▚▀▀▀ ▞▀▀▀▜▚▜TT▀▀";:P(PN)=2
965 ND=ND+1:IFND=21THEN2000
967 RETURN
970 PRINT"^▀▀▀▀/ \▀▀▀▀ /▀▀▀▀▀\/TT▀▀";:P(PN)=0:ND=ND-1:RETURN
1000 POKE2047,1:POKE53294,2:FORX=1TO800:NEXT
1005 NL=NL-1:FORX=0TO15:POKE49407+X,0:NEXT:POKE53269,128
1010 IFNL<1THEN1040
1015 PRINT"▀LIVES▀ ="NL
1020 BC=0:S$="0000":SL$="123456":CT=0:GETA$:GETA$
1025 POKE2047,13:POKE53294,5
1030 POKE53262,156:POKE53263,53:D=0:R=0:PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀";
1035 SM=12+INT(RND(1)*8):BM=BM-INT(BM)+5:M=0:FS=0:RETURN
1040 PRINT"▀YOU ARE DEAD!"
1045 POKE53269,0
1050 L=L+5*W:PRINT"▀YOU REACHED LEVEL"L
1055 SC=50*(ND*L+10.5*(L)*(L-1)+6*J)
1060 PRINT"YOUR SCORE WAS"SC
1065 HS=0:FORX=1TO4:HS=HS+PEEK(49494+X)*10↑(8-X*2):NEXT
1070 IFSC<=HSTHENPRINT"THE HIGH SCORE IS"HS:GOTO1100
1080 PRINT"▀CONGRATULATIONS YOU HAVE USURPED ALL THEOTHERS AND BECOME THE ";
1090 PRINT"SUPREME NOSER !"
1092 FORX=1TO4
1095 V=INT(ABS(SC/10↑(8-X*2)+1E-6)):POKE49494+X,V:SC=SC-V*10↑(8-X*2):NEXT
1100 PRINT"▀▀PRESS 'SPACE' FOR ANOTHER GAME."
1110 GETA$:IFA$<>" "THEN1110
1111 RUN2
2000 L=L+1:IFL>5THENL=1:W=W+1:BM=5.8-(W-1)*.4
2010 FORX=0TO20:P(X)=0:NEXT
2020 PRINT"▚":FORX=10TO33:PRINT"▀▀▀▀"A$(X):NEXT:PRINT"▀▀▀▀"A$(34);
2030 DR=3:DL=4:ND=0
2040 NL=NL+1-(L/2=INT(L/2)):GOTO1005
3000 PRINT"▚INSTRUCTIONS"
3010 PRINT"▀▀HOP ABOUT THE PYRAMID TURNING THE"
3020 PRINT"TOP FACE OF EVERY CUBE CYAN."
3030 PRINT"▀THE PLATFORMS AT THE SIDE OF THE PYRAMID";
3040 PRINT"ARE TELEPORT BOARDS WHICH SEND YOU TO"
3050 PRINT"THE TOP OF THE PYRAMID. THEY CAN ONLY"
3060 PRINT"BE USED ONCE EACH - USE THEM TO LURE THE";
3070 PRINT"SNAKE TO HIS DEATH."
3080 PRINT"▀YOU MUST AVOID THE SNAKE AND THE "
3090 PRINT"BOUNCING BALLS TO SURVIVE."
3095 PRINT"▀USE THE KEYS: Q,Z,E,C TO MOVE"
3097 PRINT"OR A JOYSTICK IN CONTROL PORT 2."
3100 RETURN
30000 DATA13,7,13
30001 DATA0,0,0,0,0,0,0
30002 DATA0,0,0,0,0,0,0
30003 DATA0,0,0,0,0,60,0
30004 DATA0,126,0,0,251,120,1
30005 DATA241,252,1,251,254,1,255
30006 DATA156,1,255,0,0,255,0
30007 DATA0,127,0,0,62,0,0
30008 DATA36,0,0,36,0,0,36
30009 DATA0,0,55,0,0,41,128,0
30010 DATA14,7,5
30011 DATA0,0,0,0,0,0,0
30012 DATA0,0,0,0,0,0,0
30013 DATA0,0,0,0,0,60,0
30014 DATA0,126,0,30,223,0,63
30015 DATA143,128,127,223,128,57,255
30016 DATA128,0,255,128,0,255,0
30017 DATA0,254,0,0,124,0,0
30018 DATA36,0,0,36,0,0,36
30019 DATA0,0,236,0,1,148,0,0
30020 DATA15,1,2
30021 DATA0,0,0,0,0,0,0
30022 DATA0,0,0,0,0,0,62
30023 DATA0,0,255,128,3,255,224
30024 DATA7,255,240,15,255,240,15
30025 DATA255,240,31,255,252,31,255
30026 DATA252,31,255,252,31,255,252
30027 DATA31,255,252,15,255,240,15
30028 DATA255,240,7,255,240,3,255
30029 DATA224,0,255,128,0,62,0,0
30030 DATA192,0,5
30031 DATA0,15,0,0,25,128,0
30032 DATA63,192,0,102,64,0,224
30033 DATA64,0,224,0,0,230,0
30034 DATA0,255,128,0,112,192,0
30035 DATA216,192,1,143,128,1,128
30036 DATA0,1,158,0,0,243,0
30037 DATA0,225,128,1,177,128,1
30038 DATA159,0,1,128,0,0,199
30039 DATA0,0,97,128,0,63,0,0
49999 REM SPRITE SET UP
50000 READ IN:READSN:READCO
50010 FORX=0TO63:READN:POKEIN*64+X,N:NEXT
50020 POKE2040+SN,IN:POKE53287+SN,CO
50030 RETURN
55000 CS=0:FORX=1TO48:READA
55020 CS=CS+A:POKE49167+X,A:NEXT
55040 IFCS<>6798THENPRINT"ERROR IN DATA LINES 60000-60030":STOP
56000 FORX=0TO15:POKE49408+X,0:NEXT
56010 CS=0:FORX=1TO64:READA
56030 CS=CS+A:POKE49423+X,A:NEXT
56040 IFCS<>8592THENPRINT"ERROR IN DATA LINES 60040-"
59000 RETURN
60000 DATA162,255,232,224,16,240,40,188, 0,193,185,16,193,201
60010 DATA153,240,241,24,125,0,208,56,233,128,157,0,208,232,185
60020 DATA 48,193,24,125,0,208,56,233,128,157,0,208,254,255
60030 DATA192,76,18,192,96
60040 DATA153,131,130,131,131,130,131,153,125
60050 DATA126,125,125,126,125,153,153,153,131,130,131,131,130
60060 DATA131,153,125,126,125,125,126,125,153,153,153,117,123,130
60070 DATA136,144,150,153,117,123,130,136,144,150,153,153,153
60080 DATA106,112,120,126,133,139,153,106,112,120,126,133,139,153,153
READY.
```



David Crisp helps you get unstuck in the joystick war

GRIPPING STUFF

OVER THE LAST FEW DAYS I have been using some of the old favourites along with some of the newer joysticks. As usual with reviews how a stick **feels** is a personal thing and what one person thinks is great another may think awful. Some of the comments regarding reliability are based on my experience working at one time in a retail outlet and so I have a good idea about whether a joystick failure was a one off, or tends to be common in that particular type.

I have dealt with them in the order they came to hand and not in order of preferance.

Each joystick I have reviewed I have taken to pieces in order to see why they failed or survived. This dismembering was only tried after I had used them in order not to ruin them if everything shot out at 90MPH and lodged itself into the walls. I tried each joystick with an arcade game of the JETSET WILLY clan, a Drawing program and the fantastic INTERNATIONAL SOCCER cartridge which is sometimes available from Commodore. The toughest test for each came when they were used with an Olympics type game where they needed to be whipped from side to side in order to make the runner run. I feel that this was the ultimate test and that this type of game is unfair to joysticks anyway. If a joystick failed in this part of the test I will make it clear. Price seems to have no bearing on strength it would appear, and the only guide I could find was the prettier they are the easier they are to break.

Quickshot 1 & 2

We sold a lot of Quickshot 1s in the shop and it seems I counted them all out and I counted them all back in again. Unlike harriers these were nearly all faulty. It seems you either love them or hate them. Personally I hate them. Some retailers say they are reliable others say they are not. I say they are not but would like to be proved wrong. When they started coming back in their droves I pulled one to pieces and the weak spot was at the bottom of the shaft. There is a small ring of plastic which actually pushes onto the cheapest switches I have seen. This ring of plastic, in all the returned joysticks, had broken and, strangely, all had broken on the left hand side.

The rest of the joystick was fine; the rubber suckers at the bottom made one handed operation easy and the contoured handle felt smashing. They were easy to hold for two handed use and were nicely packaged. It was just a shame they did not last. I did get hold of a new one for review and it broke (during a winning 100 yard dash). Same fault, same place. Life of that Quickshot...about 20 minutes.

Then came the Quickshot 2. This one lasted a little longer; about another ten minutes. Could it really be the same fault? Never. One screwdriver and a cut finger later I was pleased to see it was not. The dreaded piece of thin plastic had been replaced by a thumping great ring of thick plastic. The cheapest switches I have ever seen had been replaced by the second cheapest switches I have ever seen. They had I am afraid suffered terminal metal fatigue. The switch was a piece of very thin gauge metal with four prongs. The prong which switched to the left had broken off and the 'UP' prong was nearly off. The other prongs had signs of hairline fractures. The rest of the joystick, like the Quickshot 1, was smashing. The rapid (cheat) fire button was great, the contoured handle was brilliant, but I still could not turn left.

I look forward to being sent the Quickshot 3. I also pledge to review it with an open mind.

Kempston

The Kempston has been around a long time now and still seems to be a favourite. They are strong and very well made and have a quality of finish rare on most joysticks. I find them uncomfortable to use and would not like one myself but many would agree to differ and so I would not criticise it. A lot were sold in the shop and, to my knowledge, not one has been returned. I can't seem to get comfortable with the fire buttons. The price is good and, as I have said, the quality of the finish is the best of all those I have reviewed. I can see the Kempston continuing to sell well; no frills with it but a stayer, it is totally black except for the enormous red fire buttons.

The Cambridge joystick

Quite different to the standard breed this one: at first it was only available with an interface but now just the joystick can be purchased to use with any console that uses the nine pin plug. As can be seen, it is a different style and at first glance would not seem to be suitable for the fast shoot'em up type games. I used one with a Spectrum at first and although they are not perfect they do perform well. They are self-centering and once you have got the hang of the small degree of movement they are a treat to use. The metal shaft is strong and they lasted through all the above games. When I worked in the shop we sold quite a few of these and only had one returned. This was due to poor soldering on the inside of the stick, which was easily repaired. When I had finished I looked at all the others but it seemed to be a one off fault. They are made from a hard plastic, are very strong and withstand almost anything. They come in an enormous box which swamps the stick but this is due to the fact that the same package is used for joysticks which are sold with the interface software.

This joystick comes into its own when used with drawing type software. Because you hold the stick as you would a pen or pencil it is possible to be very precise when drawing in high res mode. Not so easy with a big stick of the standard type. There is another joystick available which looks exactly the same as this one but it is not self-centreing. That does not sound too bad until you come to use it, and believe me it's a pig. If this is the stick you would like then ensure you get the self-centreing model. As with the Atari the part that you hold does not look comfortable but once you are used to the feel it is fine. It is without doubt a two handed job and attempts to stick it down for one handed operation have not been successful. It will stick down OK but, using it with one hand, it is uncomfortable as well as difficult because your wrist keeps touching the fire button. The price is good and it is a well made stick which looks practical and performs well and from my experience is very reliable. As we are on the subject of reliability I will now deal with the two baddies of the bunch.

The BOSS

'The Boss is here' so the box says. This one feels very heavy and sticks quite well to the surface mainly due to its own weight. Its external design, except for the single fire button, is similar to the trusty old Quickshot 1 but the similarity ends there. It lasted the course and I was blisterless. The contoured grip turns on its stem and I found that most disconcerting. It is strong and its internals seem to confirm that. I still cannot decide where it gets its weight from. When I opened it up I expected to find a lump of metal but it was not there. What I did find however were the strongest hunkiest leaf switches I have ever seen. I feel confident that this one will continue to work for a long time. The casing is as strong as any of the others and it looks good in its grey and black coat. The fire button was not the most pleasing I have used and did not seem very positive at all. There was no click to it. I think it would be a good alternative to the Quickshot if you really want that type of stick, and it appears that it would give you a lot more service. Due to the rotating shaft I did find that it was possible to find yourself going the wrong way but after getting used to it I found it less troublesome. For some reason I was left feeling unexcited by this one.

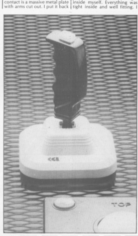
Super Stick

The Super Stick looks like a joke. Its stylish box says it is built to endure longer than most joysticks and boasts a one year LIMITED warranty. When I had taken it from its box I had to stop laughing long enough to try it. It looks foul, phallic and inferior. (I was proved wrong). The SUPERSTICK is pretty — just like the elephant man! It would look better if the colours were reversed. I couldn't take their claims for it being strong seriously at all but it survived. I pulled it apart and was amazed. There was almost nothing in it that could break. Its internals should be a lesson to all joystick manufacturers. The switches are balls of metal sunk into plastic stems. The contact is a massive metal plate with arms cut out. I put it back together and plugged it back in and tried to break it. I couldn't. I pulled it to pieces again to see if it had suffered. Not a mark. It still looks foul and it still looks phallic but it is definitely not inferior. If strength is more important to you than looks then have a look at the SUPERSTICK. It has only got one fire button. It slides around the table like it has got a mind of its own; the non-contoured handle slips and it looks funny but I challenge you to break it. Nice one. Great for kids and gorillas.

The ZipStick

The ZIPSTICK is another that stood the test of the Olympics. It is advertised as strong and it is. The central shaft of the stick is a solid metal bar. A large coloured diagram comes with this stick showing it's internals but I still felt the need to get inside myself. Everything was tight inside and well fitting. I could see the solid shaft and I was surprised to see fairly standard leaf switches. The way thev were placed though and the mechanism of the stick itself made them potentially a lot more hard wearing.

Again this one is a no frills stick but it was very responsive and quite unforgiving. It is more comfortable in use than it would appear and it was very clunky. The clunks are noisy but they do sound METAL. A couple of people who have seen it have also liked it and commented on how strong it was. This is another one that I tried to break. I succeeded in smashing my knuckles against the computer console and that was the only damage. It seems a little expensive but it is so well made that the cost seems justified. The fire button is on the base of the stick and is a little difficult to use if you are using it hand-held. My fingers would not quite reach up to the button but if you fix the stick down there is no problem. The coffee and cream colouring look nice and blend in well with my bruised knuckles.



Cheetah

Well then, that's the lot. You may have made up your mind as to which you would like. I have. If I was going down to buy a stick today and could choose any of these I think I would go for the ZIPSTICK. It's a little on the pricey side but worth the extra. If my funds were limited then without any doubt I would choose the gruesome red and black monster that goes by the name of SUPERSTICK. I ask myself why but I don't know. It's just so strong.

Before ending this article I should mention that a new type of stick has just been announced. At the time of writing it was not available for the 64 but it's release should be only days away. It has been released for the Spectrum and from what I understand it has had rave reviews. You may have gathered that I am on about the new infra red joystick from Cheetah. No leads on this one just pure infra red light. It is supposed to have a wide angle of light spread so that when you and the joystick dive to the left to avoid that last Galaxion it should still respond. I am sure that this one will soon be reviewed in this magazine so if you are thinking of spending about £30.00 on a stick (I believe this will be about the price) then this may be worth hanging on for. I wonder if it will interfere with the video recorder remote control?

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SOFTWARE SPOTLIGHT

Once again, our diligent reviewers have burnt the midnight oil to bring you this month's 64 and VIC 20 software selection.

64 Doctor

★ ★ ★ ★
Computer Software Assoc.
CBM 64/SX64

The DOCTOR 64 package is a diagnostic program for Your Commodore. It bears a resemblance to a unit for servicing BBCs called a F.I.T. test board (FINAL INSPECTION TEST). It will not diagnose faults on a dead machine as it must be loaded in order to run but this aside it really is a useful program. I think that the people who would find most use for it are small retailers who have no full service department; this would enable them to check machines prior to sale. Also, I found identify faults that are due to operator error as opposed to a machine fault. The program is nicely packaged and, as usual with disc, loaded first time. You can then select which part of the machine you want to check or an autotest routine goes through selected checks and ends with a list of checks completed with a pass or fail mark. Pictures are used to illustrate the items you can have checked and when a particular item is checked it slowly sidles off to the side of the screen and then the screen clears to give you instructions to continue that particular part of the test. The scrolling pictures are not really necessary on a program of this type and seem to only have the purpose of prettying up the menu. In fact when you are going through a series of tests, the wait while the picture moves is an irritation. I will list the items that can be checked with a brief description of what each test does.

KEYBOARD TEST

As with the BBC FIT test this shows all the keys on the screen, and as you press each key the relevant key on the screen disappears. As Commodore keys are notorious for gunking up this small quick test will allow you to check most of the keys at once.

JOYSTICK TEST

When this is selected you are asked to select port 1 or 2. A graphic representation of possible joysticks movements appears as well as a circle to represent the fire button. As you move the stick or press the fire button a dot appears to show that a good signal has been received. I found this useful when doing joystick reviews as I could confirm that joysticks had failed as opposed to the joystick port.

RAM TEST

This test checks all available RAM in order to identify faulty IC's. On screen all that is shown is a row of dots. As the test progresses the line of dots gets longer. This is another useful test as one faulty RAM IC may allow the computer to work OK unless that particular chip is called. Of course if the IC at the start of BASIC is duff then the program would not load in the first place.

PRINTER TEST

Understandably this routine will only check printers connected through the serial port. With such a wide variety of printers available it would be very hard if not impossible to write a routine to check printer function when it is connected through the user port. This is another test which I have used many times when asked to look at non—functioning systems.

DISC TEST

This is a similar routine to the one found on the Commodore test/demo disc when you buy a 1541 disc drive.

It does a read/write test to each part of the disc and checks for read/write errors. Another useful test: I did not find a way of checking my second drive which has a hardwire modification designating it as device ten as opposed to eight.

VIDEO TEST

More of a test card really. It simply shows a line of coloured bars and points out that this is a good time to adjust colour brightness etc. I think that a video fault would be apparent without this.

SOUND TEST

This displays a musical stave and plays a scale on each voice. The sounds are pretty gruesome notes and not very clean anyway. At first I thought maybe I had a duff SID or speaker coil but when I checked other 64s they sounded just as bad and so it must be the program.

CASSETTE TEST

On the SX64 this is not relevant and when it is run the program drops out with an error. This is not really a fault in the program just a disadvantage with the SX64. If you run it with an ordinary 64 it performs a read/write test but if you did have a read fault then how did you load this program?

Other reviews for 64 Doctor have questioned the value of a program that must be loaded and run in order to see if a machine is sick or not. As I have said before this IS a valid workshop tool and useful at home. It is not something that you would use very often but is reassuring if, for instance, your joystick does not work and you wonder if the last time you unplugged it with the power on maybe you did mess up the port (I plead guilty to doing that more than once)

One of these would be useful in a retail outlet as well as a club or school. It is the only one of its type I have seen for the 64 and what it does it does well.

D.C.

Zim Sala Bim

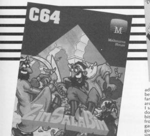
★ ★ ★ ★
Melbourne House
£9.95
CBM 64

I'M NO REAL ADVENTURER but I know enough to recognise that Zim Sala Bim is full of promise, eastern promise to be exact. And an adventure with arcade style graphics and scrolling screens into the bargain all accompanied by highly atmospheric Arabian music. So to the storyline. Your village has been savagely raided by the Sultan, all the money has been stolen and it is on the verge of starvation. You are the only able bodied man left and you have been chosen to break into the Sultan's palace and recapture the hoard of cash. The trouble is that if you break into the palace unprepared, the Sultan's guards might catch you and sling you in the dungeon. But then, wandering in the desert has its dangers too. However, the fact that you can actually move around each location means that some of the objects to assist you in your task can be easily found. Others are hidden and have to be discovered. You will need all the help you can get particularly if you are to avoid the stench of rotting food in the dungeon. But please, don't let that put you off. **K.M.**

Fame Quest

★
Brain Games
£7.95 (cassette)/£9.95 (disc)
CBM 64

THIS, SAYS THE COPIOUS instructions, is an olde worlde game and by golly it shows. And just in case you were wondering, it has absolutely zip to do with the dancing sopranos in the TV programme of a similar name. It is set in the days when demons, dragons and knaves still roam free and an aspiring young knight must win fame and fortune before being accepted into the royal court. To meet the necessary requirements a knight must journey from one royal castle to another gaining fame in battle and enough gold on the way. Fortunately he has a certain amount of gold to start with, enough to buy some weapons to see him through the initial encounters on the journey. To add to the excitement (yawn), the screen is split into five extremely static boxes, the most exciting of which is a map of the player's position. Oh dear, what a bore.
K.M.



Brain Games
FAME QUEST
CBM 64

FRED
CATACOMB ACTION FROM
QUICKSILVA
COMMODORE 64
AND JOYSTICK

Football Manager

★ ★ ★ ★ ★
Addictive Games
£7.95
CBM 64

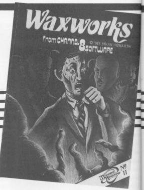
SO YOU FANCY YOURSELF AS a Lawrie McMenemy do you? Totally devoid of a footballing background and yet the manager of a successful first division football club? Well here's your chance. But watch out because it's a game addictive by name and addictive by nature. Now it may be a game you are already familiar with because it's been around for some time on (dare I say it) the Spectrum but that doesn't mean to say that it is a bit of second-hand tut. Far from it. In fact it is one of those games that is worth its weight in gold. The object of the game is simple: to take over a club at the bottom of the fourth division and with skill and dexterity to take it to the top of division one through a series of league and FA Cup matches. There's a chance to dabble in the transfer market to improve your team's skill and even borrow cash from the bank to keep your club afloat! Each player has a skill factor and energy reserves which become depleted the more he plays. Players also become unavailable for selection because they are injured. Once you have picked your team, the computer plays out the matches before your very eyes. Shock results can upset the odds and the team' morale factor varies according to the success of the team. But don't get too flush with a run of success. The managerial seat is not all that secure and a few bad games could get you the sack. Move over Subutteo because here comes a game that is going to glue you to that screen. **K.M.**

Fred

★ ★ ★
Quicksilva
£7.95
CBM 64

JUST AMAZING ISN'T IT, THE NUMBER of maze games there are around these days? So what's one more amongst friends you might well ask? But before you get too despondent, it's worth noting that Fred still has something to offer the genre. Fred is stuck underground and desperate to get out. The only problem is that he's got to find the bomb and various other artefacts and detonate them on the outside without blowing himself up before he can pass on to the next level. Naturally there are traditional nasties wandering around the maze determined to put a spanner in the works. Sounds even more like you've heard it all before, doesn't it? Well, not quite, because the graphics are exceptionally good and Fred is a master of a rope climbing act. Whilst in the maze Fred's strength is sapped as the nasties catch him and drops of acid rain fall on him from the roof of the caverns. But it is not a one-sided affair. Fred has a gun and six bullets which are replenishable with which to repel the nasties and his strength can be restored by finding the magic elixir. All there is left to do is find your way out of the maze ... and with a horizontally and vertically scrolling screen, it is not as easy as it sounds. What's more, the higher the skill level you choose, the more difficult it is.
K.M.

SOFTWARE SPOTLIGHT



Waxworks

★ ★
Channel 8 Software
£9.95
CBM 64

YOU WAKE UP IN THE lounge of a waxworks and, as the words say on the package ... in such macabre surroundings dreams end and nightmares begin ... Well the only nightmares I'll have will be trying to figure this infernal game out. It's not that it's difficult but the problem is what words to use. Lack of communication is very evident, it may just be me or this game reflects the feelings of the waxworks — dark and forboding!

The program itself isn't in the same category as the infamous Zork series but it is a nice try. The graphics aren't as good as the Dallas Quest (which is on disc only) but the software company does have an intriguing fill command. If you are wondering why I haven't said anything about the plot, that is because they do not mention one! It's up to you to explore the waxworks and learn by your mistakes. So in my opinion (I've been spoilt) it is a standard adventure with standard graphics, but I'll still try and solve it just to put my mind at ease.

S.L.F.P.

Savage Pond

★ ★ ★ ★
Starcade
£7.95
CBM 64 + Joystick

SOMEHOW I GET THE IMPRESSION that this might be a little conservation orientated. Not only do you learn about the evolution of a life commonly known as the frog, but it also gives hints about nuclear waste and on the higher levels you will find mutant creatures ready to kill you if you don't kill them.

The idea of the game is evolution: breed as many frogs as possible before ending up as some creature's dinner. As it says in the booklet that comes with it "How else can we continue to play frog games, after all they have to breed somewhere". This is true!

The game opens with you hatching as a frog spawn feeling very hungry, so you eat the pink amoeba and the eggs which the dragonfly drops into the water. If the eggs aren't eaten they hatch and eat you.

To evolve takes a little while, because you have to consume five worms to go onto the next stage of development. Other hazards include jelly fish, hydra, spiders and nuclear waste which has been dumped in the pond. Even if you do die I think you will still want to start again and discover the birds and the bees about frogs!

S.L.F.P.

New York Blitz

★ ★
Mastertronic
£1.99
VIC 20 Optional Joystick

I LOOKED AT THIS GAME THINKING have Mastertronic brought out a new original game at the cheap price of £1.99? Alas not, this is yet another copy of Blitz or the similarly named City Bomber. If you have never played this sort of game the basic aim is to flatten the city in order to land your aircraft which is running out of fuel. Once loaded, which it does with ease, you can begin. The aircraft moves across the screen, gradually decreasing in height. To bomb, press any key (you can't make a mistake as any key will do) or press the fire button on the joystick control. Surprisingly one bomb will destroy a whole sky-scraper; this makes it a very simple game and I went through the cities with apparent ease. Cities to destroy include Baltimore, Seattle and, of course, New York. Once destroyed your aircraft lands automatically. The graphics are one character and the skyscrapers look like ice-cube containers. The sound leaves a lot to be desired. The only good point in this game's favour is the price. At £1.99 it must be the cheapest bomber/blitz game around but as the old saying goes, 'Cheap and Nasty'.

P. W.W.

DANGER
MASTERTRONIC
NEW YORK BLITZ
199 RANGE

Kalah

★ ★ ★ ★

Talent Software
£7.95 (cassette)/£9.95 (disc)
CBM 64

IT'S DONE IT AGAIN! THE machine has got it in for me. Every time I come up with a good move it comes up with a better one. Mind you, I have only been playing this game for an hour.

Kalah is a board game, a frustrating one at that! It is, apparently, a very old game which was played in deserts by people with nothing better to do. Let me explain this gem of a game from Talent Software. The game consists of a board with 14 holes in it. You own 7 holes and so does the computer. 6 of the 7 holes are in front of you and the same for the CPU, the seventh is to your right (called the Kalah).

The basic idea is to win more than half the pebbles which are placed in the holes by moving them round the board anitclockwise. If you are confused at this point, wait until you play the game. The rules take a little getting used to but after a few games it becomes clear that this is a definite strategy game.

I think I should mention the two people involved in making this. They are Andrew Collins who wrote the program and Mike Masters who designed the graphics. They deserve a round of applause for the total package as it is very good indeed.

S.L.F.P.

for the CBM 64
REVELATION
by Steven Chapman
SOFTEK
MASTERS OF THE GAME
International
Deutsch/Français/Italiano

Revelation

★ ★ ★

Softek
£7.95
CBM 64 + Joystick

IT IS AN 'ORIGINALISH' game, but it doesn't quite get to be called totally and absolutely original. In basic terms it is a shoot 'em up game with quite a large difference. Not only do you kill all the evil monsters but you have to destroy castles which, in turn, reveal a pentacle sign. Once you have revealed all the pentacles there is a brief blue flash telling you that you can now kill the last of the monsters and escape cavern number one.

Apparently in this game there are 31 monsters all on the 40 different levels. They serve the same purpose in life: to kill you before you get to the last screen and stop the monster of Apocalypse from being crowned. That basically is what the game is about and I must say that it would be OK if it didn't take so long to play one cavern.

The graphics are fine, except for the flashing of my character (and all the others), when there is more than a certain amount on the screen. This could either be the machine's limitations of eight sprites on the screen at once or the program's limitations in using soft sprites. Overall, it is possible but as I said before, a little faster please on the early levels and is it music in the background or has a dragon got indegestion?

S.L.F.P.

West

★ ★ ★

Talent Software
£9.95 (cassette)/£12.95 (disc)
CBM 64

THIS IS A PARTIAL GRAPHICS adventure which operates in real time. In other words you could be deciding whether to shoot someone or not and they could decide that they would rather not have you around. The game West puts you in the position of being a low enforcer on the trail of a gang of mean robbers. It's your job to kill them and get promoted to Marshall. These nasty reprobates are hiding out in and around an old mining town which is now a ghost town; hidden somewhere is a large amount of loot.

The software company claims that there are between two and three hundred words that the computer will understand. Unfortunately I couldn't check that because I kept on being shot or bitten by a rattlesnake. It does have graphics, but only in certain places. The graphics are again very good. I say 'again' because the two other games by Talent have outstanding presentations.

S.L.F.P.

Interdictor Pilot

★ ★ ★

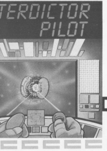
Supersoft
£17.95 (cassette)/£19.95 (disc)
CBM 64 + Joystick

HAVE YOU EVER TRIED TO FLY the latest in space defence craft from the Federal Inter Starbase Patrol Force (FISPF)? I have and it's exceptionally difficult and dangerous. Supersoft have generated a different type of flight simulator. Whereas with most simulators a small manual is provided, Supersoft have gone all the way in producing a 47 page flying handbook with everything in it except how to make the coffee!

The game opens with you enrolling as a Sub-Lieutenant in the FISPF. You are then transported to your craft waiting at one of the hangars. You have the choice of either going out into space or just running the inbuilt simulator to learn how to handle the Interdictor Mark III. It's one of those games that will take a lot of playing to get used to and reap the best from it as a simulator.

The only drawback with this game is that it is quite slow and occasionally death came painfully slow indeed.

S.L.F.P.



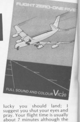
Election Trail

★ ★
Brain Games
£7.95 (cassette) £9.95 (disc)
CBM 64

YES FOLKS, IT'S ELECTION time again in the jolly old US of A and Wally Mondieu is busily beating a path to Rodeo Ronnie's door. Election Trail is here to help you indulge in all the fun of the fair in the comfort of your own home. It's a one or two player game. If the one player option is chosen, the computer plays the Democratic party. The object of the game is simply to win the Presidential election and you do this by winning the most states in each of the four regions. At each turn you are invited to do one of four things: hold a rally, go on a campaign tour, hold a press conference or hold a public meeting, each of which depletes your cash-rich coffers. You then get the opportunity to either raise more cash, take a rest, look at the opinion polls or seek an endoresement. At the end of 20 turns, the whole cotton-picking roadshow grinds to a halt and the states are carved up between the reds and the blues. Although there is an element of strategy to the whole thing the degree of dependence on the computer is still quite high. **K.M.**

Flight Zero-One-Five

★ ★ ★ ★
AVS
£5.95
VIC 20


FLIGHT ZERO-ONE-FIVE
FULL SOUND AND COLOUR VIC20

AT LAST A FLIGHT SIMULator for the unexpanded Vic owner. Is this a miracle I ask myself? Yes, but it is less complicated than other games available for the expanded VIC 20 but just right for a beginner. The insert gives very good instructions on how to take off, cruise, descend and land. Once loaded, which it does without difficulty, press F5 to start the engines, hold F5 to start to taxi down the runway and with a minimum of 390 revs you're ready to take off. Press F3, your brakes are off and your airspeed builds up. Press and hold < (nose up): You're now cruising through the air. You do suffer from random turbulence from time to time and have to correct your course. Descent and landing need to be thought about: check your airspeed and lower your undercarriage to get your nose down. Press < : if you're lucky you should land; I suggest you shut your eyes and pray. Your flight time is usually about 7 minutes although the insert quotes 5 minutes. I couldn't find any bugs. The graphics are limited but the sound is quite good; when you rev the sound pitch increases. Overall it is a very good flight simulation and the programmer has my congratulations for getting it into 3.5K. Well done.

P.W.W.

SOFTWARE SPOTLIGHT

H.E.R.O.

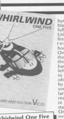
★ ★ ★ ★ ★
Activision
£9.99
CBM 64 + Joystick

H.E.R.O.
ACTIVISION

ACTIVISION WERE A GAMES manufacturer for Atari's game Console. So what? I hear you ask. Well, the good thing about this company making software for the CBM 64 is that they are producing very good quality products. H.E.R.O. is a prime example of what they can do.

It is original, fast and has very good quality graphics. Some miners have been trapped down a mine shaft and it's your job to be a 'Hero' and save them. Sounds easy and it is for a couple of levels. Whilst traversing the mine shaft you will have to blow up walls and shoot creatures. To blow up a wall you'll need dynamite: you are supplied with six sticks, so use them wisely and don't stand too close. To make life easier you have a jetpack which enables you to ascend and descend with grace and care as the tunnels go in all directions. Once you have saved the miner, level two starts, exposing a little more of the mine shaft and a few more obstacles to get over. Good examples are the lava walls and lava flows: if you walk or land on these obstacles you lose a life.

S.L.F.P.



Whirlwind One Five

★ ★ ★
AVS
£5.95
VIC 20

HELICOPTER GAMES ARE FEW and far between and this one from AVS is the first I have seen for the VIC. The game loads very easily. To take off press F1 but do wait until the rotor blades of the helicopter are at full speed before take off. Using the keys Q A O P your first assignment is to blast rockets which appear horizontally across the screen. Once you have achieved this the second screen appears. On this screen you are on a small base station which moves from left to right. Your assignment is to shoot down approaching objects. Your fuel is increased by 10 points for each success you have. Once the maximum target of 300 points has been reached you can then take off in your helicopter Your base station has to be destroyed. Once airbourne fly directly over the base and then drop your load; you then return to screen one. Sound easy; don't you believe it, it took me five or six goes to get it right. The graphics on this game are quite good as are the choice of colours. I also like the little touches which help to make it more interesting; a good title page and good sound.

P.W.W.

Jetpack

★ ★ ★ ★ ★
Dataview Wordcraft
£14.95 (cassette)/£39.95 (disc)
CBM 64 disc/cassette

AT FIRST GLANCE IT IS NOT easy to tell what this package does. The picture on the pack indicates a game, the wording indicates a language and the company name suggests it may be a word processor. There is almost nothing on the packing to indicate that it is a BASIC compiler. A compiler is a program which converts a program into another form to increase speed and efficiency. In all machines that run in anything other than machine code an **interpreter** has to be present to convert the program that has been entered into a form that the processor can understand. This conversion and checking takes time and can slow a program down so much that it crawls. Compilers turn a program into a form that is faster, closer to the object code, and in some cases have additional features to pass by **bugs** or poor routines in the original machine. In the case of the Commodore it fixes the dreaded garbage collect routine, though more on that later.

ELECTION TRAIL
CBM 64

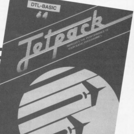
Jetpack does all these things and is 100% compatible with BASIC 2.0; this means that you can compile any of your BASIC programs without modifications, with some machines it is not possible to compile without rewriting certain parts. Another great feature of Jetpack is that if you use machine code routines loaded from within a program that is OK. In some cases it is necessary to POKE a couple of locations to do this but the procedure is so well described in the documentation that it is very very easy.

The program for disc based Commodore 64s comes with a dongle to fit into the joystick port or cassette port; in case you haven't seen a dongle before it is a small piece of simple circuitry encased in a lump of plastic about 2" x 1.25" with a plug on. This will only allow the program to operate when the dongle is present. Backup copies of the compiler are easily made but without the dongle they will not run. I use an SX-64 and while I was carrying my SX around I lost my dongle from the joystick port. My compiler will not run now, but as it is such a useful program another must be obtained. If you have a tape based Commodore 64 there is a tape version. Unlike the disc version there are limitations to the size of the program you can compile (12K) as the compiler cannot lay onto tape, in a temporary file, parts of the compiled program. The price of the tape version though is so low that it would still be an excellent buy.

When you load a compiled program it is necessary also to have a set of routines in memory which are called the runtime library. These are loaded automatically if they are not in RAM. They do not use much RAM at all and they are in a part of RAM not often used. Machine code routines that I use such as Centronics Interface Software do not conflict with the RTL. Chaining of compiled and uncompiled programs is possible and easy and it is possible to retain variable values and transfer them from program to program.

If you use non-BASIC commands called **extensions** which are defined within the program it will still compile. Warnings are given that a non-standard command has been found but provided it is a genuine extension then the compilation process and the end result will still run. Special extensions to BASIC in the compiler allow for faster sprite movement which does indeed work well and a routine also allows PEEK/POKE addresses to be automatically changed to ease transportation of programs from one machine to another. Because of time available I have not been able to investigate this function so I hesitate to comment. Claims are made that some programs will run up to 25 times faster than in standard BASIC but most programs will achieve only 5 to 15 times speed increase. This however is still a lot faster and in the majority of cases I did notice a very definite increase. I use a lot of subroutines to format figures and the delay between input, format and printing to the screen was considerably less.

For me the most impressive feature was the Jetpack **Garbage Collect**. I have one piece of software that uses almost the whole of BASIC RAM as one large string array. When the Commodore performs its infamous collect routine I have watched the machine hang up for 15 to 20 minutes while it sorts out the rubbish. When compiled it did still hang up but for less than a second. It is now a great joy to watch it hang up and burst back into life so quickly. If the Commodore collect routine has been a nuisance to you then Jetpack is an excellent buy just to stop hangups.

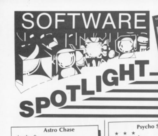


To finish then I found DTL BASIC to be excellent. Unlike some compilers it is 100% compatible with BASIC and it will also run on the SX-64. The documentation is more than adequate and well written and is I think my most often used **utility** program. I now compile all my BASIC programs if only to make them unlistable (another benefit). One important point is that although the dongle is needed to compile a program it is not required to RUN a compiled program so you can still give copies of compiled software away. Unlike some compiler producers, Dataview have adopted a very mature attitude to using the compiler with software that you want to market. If you sell copies of your compiled programs simply credit Dataview and thats all OK. A shame others do not think like that. Just out of interest, below is the memory map to show areas used by the compiler (addresses in hex).

$0000-$0800	**As per interpreter**
$0800-$9FFF	**Compiled programs and variable list array**
$A000-$BFFF	**Run time lib.**
£C000-$CFFF	**Unused**
$D000-$FFFF	**Garbage collect**

D.C.

SOFTWARE SPOTLIGHT



NEEDS 8K EXPANSION
MASTERTRONIC
PSYCHO SHOPPER
199 RANGE
ASTRO CHASE
commodore 64

Astro Chase

★ ★ ★
State Soft
£8.95
CBM + Joystick(s) (Cassette Based)

WRITTEN BY THE SAME GENTLEMAN who concocted Flip & Flop, Fernando Herrera has done it again. This game is about trying to save Earth, I say this because it is very trying, and you always lose in the end. Apart from that it is very good. The graphics with the cartoon intermissions and the 1812 overture are just right.

However, it lacks a little of the 'umph' that Flip & Flop had. The game consists of stopping megamines from hitting earth and killing as many Megadarian ships as possible whilst keeping yourself alive; simple enough! After two 'chase' sequences I didn't have any saucers left, end of game for me.

You do get shields which deplete your power, along with losers. At the edge of the galaxy there are power points from which you can replenish your weakening strength but be careful because a megamine might scatter the earth over a vast distance whilst you are performing this minor task. Eight different Megadarian fighters can be encountered on the 34 levels, of which you can select up to level 23.

The cartoons are worth watching because as you progress your man is welcomed home in different ways. It's a good game but I did find it easy to switch off and play something else.

S.L.F.P.

Psycho Shopper

★ ★ ★
Mastertronic
£1.99
VIC 20 8K RAM Optional
Joystick

YOU ONLY HAVE A SMALL AMOUNT OF time to get to the supermarket! Can you make it in time? Will you be bashed by an old Granny? These are the sort of problems you encounter in this new Mastertronic game. You are a disorientated shopper heading for the supermarket, collecting gold coins on the way. Grannies play a big part in making your life difficult. On the bumping into a mad granny or any other obstacle you are confronted with. On the second screen you arrive at the main road which you must cross avoiding the vans, cars and yet more grannies. I can guess what you are thinking, yet another version of Frogger. You're right, but this is more addictive. The third screen presents railway lines and trains. On arrival at screen four, grab your shopping trolley and off you go around a maze avoiding of course yet more grannies. Once you achieve this you're back to screen one. The graphics on this game are reasonable and the sound gives it added life. It loaded very easily first time and it has a good title page. At £1.99 it is very good value for money and a game not to be missed by any VIC owner.

Forest of doom

★ ★ ★
Puffin Books
CBM 64

LIKE THE HOBBIT FOR THE 64 THE Forest of Doom by Puffin is supplied with a book. It is worth remembering that this game is based on a book written by Ian Livingstone who is at the forefront of Dungeons & Dragons. This is an adventure game based around the basic rules of D & D. Once loaded you are confronted by a high resolution screen showing a decidedly suspicious forest.

I immediately thought that it was going to be a high quality graphics adventure. I was wrong at least up to the point I reached.

Let me explain the principles behind the game and what your tasks are. The theory is that after rolling some dice (kindly provided by the computer), you build up your character's abilities. The higher the dice roll the better. Anyway, once your character has its qualities you then get a long briefing of what has happened in the world which you are now a resident.

The plot goes something like this — you are a warrior of great reputation. One sunny day you just happen to be near a spot where this dwarf says his final words. In desparation and half madness he tells you of the four runes which have been stolen and mislaid in the Forest of Doom. He then expires and you decide to get the runes back because there might be something in it for you. From thence your struggle begins and even if you are short and clever or built like an ox (thick as one as well) you'll have some great fun.

S.L.F.P.

Archipelago

★ ★
Talent Software
£7.95 (cassette)/£9.95 (disc)
CBM 64 + Joystick

I DON'T NORMALLY LIKE WAITING 14 minutes for a program to load, but since I had already played Kalah by Talent for the 64 and was greatly impressed, I went and made myself a coffee and got ready to play Archipelago.

After reading the instructions which described Archipelago as a type of maze game, I started to have doubts. There have, in the past, been too many maze games and an addition to the very long call would make it just one more name on a never ending list. This would have to be very good to make it stand out above the rest.

The idea is to collect the mysterious jewels from a maze so that you can escape the maze and inevitably go on to progressively harder levels. As usual there are guardians who for some unknown reason want your blood.

Once loaded, the title screen and then the high score table are displayed. Then a rather nice animation of a storm battered island with a man running into a cave is initiated finally leading to the game.

As a conclusion I am tempted to say 'Nice presentation, shame about the game', but I won't.

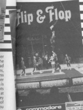
S.L.F.P.

Percy the Potty Pigeon

★ ★ ★ ★
Gremlin Graphics
£7.95
CBM 64 + Joystick

JUDGING FROM THE BLURB on the cassette insert, I thought this was going to be a pretty naff game. But how wrong you can be! Surely it wasn't me who thought a little nest building was going to be a tinge tedious? Percy, of course, is no ordinary, run-of-the-mill potty pigeon. He is downright suicidal. The object of the game is to control old Percy in flight and to swoop down on to the road to pick up all the nest building twigs he needs to pass on to the next level. There are points for every twig taken back to the nest. Naturally, it is not as easy as all that. Percy is pretty nippy in flight and almost totally uncontrollable. But that's not all. There are obstacles to avoid such as the passing cars on the road intent on turning Percy into strawberry jam and a variety of other nasties like the pigeon eating cat, the starving ferret, kamikaze planes, balloons and twig snatching sparrows. But Percy is not totally helpless. He has more than a trick or two tucked under his wing in the shape of some revolting, exploding eggs. Points are gaine for splattering the passing cars, killing the cat, destroying the flying ducks (good enough to grace any wall) and gobbling up the butterflies. So, once again, who said nest building isn't fun? Certainly not loveable little Percy, the star of this nifty little game.

K.M.



Flip & Flop

★ ★ ★ ★ ★
State Soft
£8.95
CBM 64 + Joystick(s) (Cassette based)

TRAFFIC
ARCADE/STRATEGY FROM
QUICKSILVA
COMMODORE 64
AND JOYSTICK

WHAT HAVE FERNANDO Herrera; a monkey called Mitch and a Kangaroo called Flip got in common? Well, Fernando wrote a game which includes these two characters in a very weird setting! Mitch & Flip have found that they can escape from the Zoo by completing a maze. The problem is it's in 3-D and after playing for a long time, insomnia sets in your eyes start to water! Anyway, by traversing the squares of this maze and flipping special boxes placed at random on the board, you gain points and your freedom.

The first couple of levels are dead easy once you get used to the joystick controls, the best results being achieved by holding it like a diamond (fire button pointing at the T.V.), but then the fun starts. The levels are made harder with the entry of the zookeeper on level 3 and a magic flying net on level 4. As the game progresses the maze gets larger as you complete each level. Cartoon intermissions have been included after every 5 levels of play as a reward for being very agile.

The game is superb with very good graphics and sound. Oh yes, when you play as Mitch the Monkey the board turns over and you swing from square to square! Not that easy this one and it's well worth the money. Watch out for the sticky squares, they can be dangerous or very useful as well.

S.L.F.P.

Traffic

★ ★
Quicksilva
£7.95
CBM 64 + Joystick

THE STREETS OF LONDON ARE ABOUT to descend into complete chaos. Only you have the power to prevent it. You are in complete control of the traffic lights at each of the capital's major road junctions and it is their skilful management which will stop the massive queues of vehicles from building up. With traffic entering from all sides of the screen and no way of telling whether it will turn right, left or simply go straight ahead at a junction, congestion seems almost inevitable and actually keeping the traffic flowing is more than a little difficult. So if you impress your superiors there is a chance of stepping up the promotional ladder and sorting out more congested areas. This, of course, means different screens and more difficult junction layouts. If you fail, well there is always the chance to start all over again providing you're a sucker for punishment because there seems to be very little method to all this madness.

K.M.

Daley Thompson's Decathlon

★ ★ ★ ★
Ocean
£7.90
CBM + Joystick

MAKE SURE YOU HAVE A METAL joystick for this game or it will cost a lot of money in new ones. This is a good reproduction of the arcade athletics game except that there isn't any voice synthesis. In this game you have to complete the ten events in which Daley Thompson competed in the Olympics.

The graphics on this game are very good with excellent use of sprites for both Daley and the Computer (your challenger). Throughout the ten events your scores are registered, the world record is displayed and the crowd cheers whether you win or lose. My comment about the joystick referred to the way you make Daley run. This is accomplished by a side to side motion of the joystick: the faster you move it, the faster he runs. The fire button is also used to make him jump and throw.

I did enjoy this game immensely but when I jumped or threw something, my man always fouled or fell over. It's worth playing but I do miss the voice at the beginning.

COMMODORE 64
DALEY THOMPSON'S
DECATHLON
ocean

S.L.F.P.

This utility from Mike Hart should help you format numbers correctly and iron-out bugs associated with INT functions on your 64.

PRINT USING ON THE 64

MANY ROUTINES HAVE BEEN published in the past to provide a way of 'formatting' numerical data so that the data is rounded to the specified number of decimals and to ensure that the decimal points line up when the data is printed in a column. Many of these routines are very long and tortuous and may slow the system down considerably if there are a lot of numbers to process. I therefore decided to write a routine (in BASIC) which would be as short and as economical as possible, which would approximate to the speed of machine code routines and which would format fully even 'difficult' numbers such as those expressed in exponential mode.

In particular, the routine needed to:

— round both positive *and negative* numbers correctly avoiding the errors that are occasionally introduced when the CBM arithmetic function processes certain numbers (e.g. try to round 812.676144 by using the INT(X★1000+0.5)/1000 approach!)

— process numbers less than ±0.01 which would otherwise be expressed in exponential mode

— put in leading zeroes for values between ±1 and −1 e.g. to ensure that .7 is expressed as 0.7

— add a fractional part of trailing zeroes to ensure consistency so that to three decimal places 2.3 will be expressed as 2.300 and that 2 will be expressed as 2.000 for example.

The routine presented here is effectively contained in three lines i.e. lines 3-5 and assumes that whatever number one wishes to process has been copied into the variable Z. The other variables associated with the formatting subroutine all start with Z so that the programmer can avoid contaminating the rest of the program. Line 1 sets up certain default values but these may be changed in the course of the program if desired. The demonstration is set up with three decimal places (Z3), a rounding factor of 1000 (Z4) and a 'field-length' of 9 (Z2). The string of padding blanks (Z1$) can always be made longer if desired and obviously the GOTO at the end of line 1 points to the normal start of the program. Notice particularly that Z4, the rounding factor, is specified *exactly* — if you attempt a short-cut such as Z4=10↑Z3 then the result may be internally stored in a slightly inaccurate form and this may introduce errors later on. This is due to the fact that exponentiation involves manipulating the logarithm of a number and some loss of accuracy is potentially possible. A 'balancing factor' (Z6) is included to compensate for occasional failures to round exactly.

The internal construction of the program is as follows:

Line 3.

Makes a rounded string of the number multiplied by the rounding factor. Notice that this works just as well for negative as for positive numbers. The 'balancing factor' (Z6) is necessary due to the fact that the CBM interpreter does not force a round before performing INT and one has to correct this deficiency. The balancing factor is the smallest that trial-and-error has demonstrated to be effective for both positive and negative numbers. If you wish to demonstrate the presence of the INT bug for yourself then try the following:

```
PRINT 123.4555★1000+.5,
INT(123.4555★1000+.5)
```

Both should give 123456 but the INT gives 123455 due to the bug. The presence of the 'balancing factor' enables numbers such as 123.4555 and −123.4555 to round correctly to 123.456 and -123.456 respectively. If you do not mind the occasional inaccuracy caused by the failure to round up then you can cut out the reference to Z6 in Line 1 and the whole of the term Z6★SGN(Z) in Line 3. This also has the by-product of speeding up the whole subroutine by some 10% but personally I would rather sacrifice a little bit of speed for complete accuracy. (Incidentally, the PRINT USING routine in the COMMAND-0 chip will fail to round a negative number such as -123.4555 to three decimal places correctly!)

Line 4.

Is only called into play for numbers (positive or negative) that are less than 1 and require a leading zero to be inserted. The effect of line 4 is to turn, for example, -.123 into -0.123 or 7E-03 into 0.007. Numbers that would normally be expressed in scientific notation get turned into 'normal' numbers by this line but a similar technique is not used for very large numbers which generally constitute less of a problem.

Line 5:

This line is one of the most critical in the whole subroutine. If we assume that a Z of 123.4555 has been converted to the string Z$ of 123456 (in line 3) then this line inserts the decimal point in the correct place, pads to the left with blank spaces and prints out the result (leaving the cursor on the same line) before RETURNing. It is obviously necessary that integers avoid this line altogether and that is why they are taken care of by the conditional statement at the end of line 3.

How fast?

Given that care has been taken to ensure that the routine is as accurate as possible, how does it compare with machine-code routines for speed? In order to make meaningful comparisons, I undertook some trials in which I compared this BASIC PRINT USING with (a) the COM -0 chip PRINT USING in a BASIC4 4032 PET (b) the PRINT USING routine given by Raeto West in 'Programming the PET/CBM'. The results are summarised in the table below:

PROGRAM	*MACHINE*	*AVERAGE TIME*	*NOS. PER SECOND*
BASIC PRINT USING	C-64	0.0540	18.5
WEST PRINT USING	C-64	0.0411	24.3
BASIC PRINT USING	4032 PET	0.0518	19.3
WEST PRINT USING	4032 PET	0.0375	26.7
COMMAND-0 PRINT USING	4032 PET	0.0472	21.2

The BASIC PRINT USING stands up pretty well to the machine code opposition! In the case of the WEST routine, the routine works by truncation and does not round at all (and you have to do this before the number is sent to the subroutine) nor will it attempt to process numbers expressed in exponential format (such as 1E-03) which severely limits its usefulness. As we have seen the COMMAND-0 PRINT USING also has some deficiencies and will also make a mess of some exponential numbers e.g. 1E-03 which is 0.001 emerges as -03.000 to three decimal-places! All in all, the BASIC PRINT USING comes out well in the accuracy stakes and also accuracy stakes and also formats and prints at some 19 numbers to the second which, as you can see, starts to get pretty close to the speed of the machine code routines in any case.

Use of PRINT USING

To incorporate this PRINT USING routine into your own programs it is best to type it in exactly as shown from lines 1-6 (although lines 2 and 6 are only given colons to assist readability) i.e. the routine should be at the very start of the program. The reason for this is that line 1 defines variables at the very start of the program and when these values are called the internal routines do not have to search through other variables in order to find them. For the same reason, constants have been defined as variables as this, too, speeds up the entire subroutine. These techniques are applicable to other BASIC programs as well where speed is the essence. If you know that you are not going to require integers then you can cut out the whole of the conditional statement contained at the end of line 3 and this too will speed processing slightly.

To call the subroutine merely copy whatever variable you wish formatting into Z and then call the subroutine with GOSUB 3. You may consider that this is a slightly messy way to do it — why not use a user-defined function instead? As you might have guessed the user-defined function takes quite a bit more time to process and therefore I chose the 'copy' method.

If you wish to alter the number of decimal places in the course of the program then you need to alter the parameters of Z3 and Z4. To effect the change, make Z3 the number of decimal places required and Z4 the relevant rounding factor. For example, to round to two decimal places make Z3=2 and Z4 = 100 before the subroutine call. These values remain in effect until you change them again.

Program listing

```
BASIC PRINT-USING  BY M.C.HART

1 Z$="":Z=0:Z3=3:Z2=9:Z4=1000:Z5=.5:Z6=0.0000307:Z1$="         ":GOTO10
2 :
3 Z$=STR$(INT(Z*Z4+Z5+Z6*SGN(Z))):IFZ3=0THENPRINTRIGHT$(Z1$+Z$,Z2);:RETURN
4 IFABS(Z)<1THENZ$=LEFT$(Z$,1)+RIGHT$("000"+MID$(Z$,2),Z3+1)
5 PRINTRIGHT$(Z1$+LEFT$(Z$,LEN(Z$)-Z3)+"."+RIGHT$(Z$,Z3),Z2);:RETURN
6 :
10 X=RND(-5):N=16:C=1
20 FORJ=1TON:X=EXP(RND(1)*14-5)*C:Z=X:IF J<10 THEN PRINT" ";
30 PRINTJ,X;SPC(18-LEN(STR$(X)));:A=TI:GOSUB3:B=B+(TI-A):PRINT
40 C=-C:NEXT:PRINT
50 AV=B/(N*60):PRINT "AVERAGE=";AV;"SECS"
60 END
70 :
100 REM Z   = ORIGINAL NUMBER (COPY)
110 REM Z$  = OUTPUT STRING
120 REM Z2  = FIELD LENGTH
130 REM Z3  = NO. OF DECIMAL PLACES
140 REM Z4  = ROUNDING FACTOR
150 REM Z5  = HALF-ADJUST (0.5)
160 REM Z6  = BALANCING FACTOR
170 REM Z1$ =.STRING OF PADDING BLANKS
180 :
190 REM 3 DECIMAL PLACES BY DEFAULT
200 :
210 REM FOR DIFFERENT FORMATS MAKE:
220 :
230 REM Z3 - DECIMAL PLACES REQUIRED
240 REM Z4 - RELEVANT ROUNDING FACTOR:-
250 :
260 REM Z4  =    1 FOR INTEGERS
270 REM Z4  =   10 FOR 1 DECIMAL PLACE
280 REM Z4  =  100 FOR 2 DECIMAL PLACES
290 REM Z4  = 1000 FOR 3 DECIMAL PLACES ETC
300 :
310 REM E.G. FOR TWO DECIMAL PLACES
320 REM Z3=2:Z4=100:Z=X:GOSUB 3:PRINT
READY.


  1              1967.23982             1967.240
  2             -3074.13678            -3074.137
  3              12.0174446               12.017
  4             -105.726891             -105.727
  5              156.080935              156.081
  6             -7.10634987E-03           -0.007
  7              .196348429                0.196
  8             -3413.08353            -3413.084
  9              408.71706               408.717
 10             -4121.74225            -4121.742
 11              .0454505401               0.045
 12             -4653.52048            -4653.520
 13              142.590925              142.591
 14             -.998771292               -0.999
 15              0.19995891                0.200
 16             -.323167219               -0.323

AVERAGE= .05 SECS
```

A meander along your favourite river may take a nasty turn when confronted by F.G. Tout's grisly Gators!

GATOR

IN THIS GAME YOU PLAY THE part of Joe, out for a quiet boat ride at your favourite beauty spot. Suddenly you realise that someone with a warped sense of humour has set loose a shoal of dangerous and ferocious alligators, intent on making you their meal of the day.

Guide Joe through 4 waves trying to steer clear of floating logs, other boats, rafts, floating weed — but, above all, watch those Gators!

When you reach the narrow exit you have to guide Joe through the locks without hitting the walls or overhanging rocks. There is also a hole in the boat and you must use the fire button to bale out or the boat will sink. You also have a time limit — so don't hang around too long.

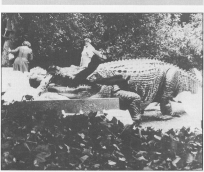
The time limit and water level are shown at the bottom of the screen:

Time...WHITE
Water level...BLUE

Plug your joystick into port 2. Normal joystick movement applies on the lakes but on the locks screen you can control Joe by:

Left.......reduce speed of boat
Right.......increase speed of boat
Up......increase level of water

You have 5 lives.



Variables

V	53248 (sprites)
Q	(sprite locations)
CO	(colour of water level and time limit
TL	(time limit)
WL	(water level)
L	(joystick port)
S1,S2,S3	(sound)
SYS 36864	(sound on)
SYS 37120	(sound off)
L1	(lives)
LE	(lake number)
SC	(score)

Type in parts 1 and 2 separately.

Program Information

Gator — Part 1

10-200	Music interrupt and data
29999-61000	Sprite data
62000-62030	M/C Hi-res clr screen
62050-62150	Download U.D.G.s
62155-62235	Sprites for title
62300-62570	M/C routine to move sprites

Gator — Part 2

0-50	Set variables
100-135	Set sprites pos.
600-999	Set time and water level
1000-1099	Main routine
10000-10199	Screen 1
11000-11099	Screen 2
11100-11199	Screen 3
11200-11288	Screen 4
22000-22040	Lives left
23000-23155	Game over
30000-30199	Locks screen
60000-60998	Titles page
60999-61199	Music for title page
63000	Joe goes walkabout

Program Listing Part 1

```
GATOR  1

10 PRINT"":FORT=0TO2:FORX=0TO255:READA:IFA=-1THEN40
20 POKE36864+T*256+X,A:NEXTX
40 NEXTT
50 DATA169,146,141,21,3,169,0,141,20,3,96,-1
60 DATA169,234,141,21,3,169,49,141,20,3,96,-1
70 DATA172,0,147,192,16,240,57,206,1,147,173,1,147,201,0,208,44,230,0,147,169
80 DATA0,141,4,212,169,31,141,5,212,169,0,141,6,212,169,17,141,4,212,185,0,147
90 DATA185,0,149,141,1,212,185,0,149,141,0,212,185,0,150,141,1,147,76,49,234
100 DATA169,0,141,0,147,141,4,212,24,144,242,-1
110 POKE37632,0:POKE37633,0:FORT=0TO82:READHF,LF,D
130 POKE37888+T,HF:POKE38144+T,LF:POKE38400+T,D:NEXTT
135 POKE38144+T,22:POKE38155+T,227:POKE38400+T,100:POKE37380,T+1
140 DATA25,177,30,25,177,30,32,94,30,20,214,30,25,177,30,22,227,30,22,227,30
145 DATA20,214,30,25,177,30,22,227,20,17,37,30,19,63,30,21,154,30,22,227,30
150 DATA21,154,30,22,227,30,25,177,40,20,214,20,22,227,100,0,0,20,25,177,30
155 DATA25,177,30,32,94,30,20,214,30,25,177,30,22,227,30,22,227,30,20,214,20
160 DATA25,177,30,22,227,30,17,37,30,19,63,30,21,154,30,22,227,30,21,154,30
165 DATA22,227,30,25,177,20,20,214,20,22,227,100,30,126,20,20,126,20,34,75,30
170 DATA25,177,30,22,227,30,25,177,30,20,214,30,32,94,30,34,75,30,43,52,30
175 DATA43,52,30,43,52,20,30,126,20,25,177,30,20,214,30,22,227,30,25,177,30
180 DATA20,214,30,25,177,30,22,227,30,21,154,30,19,63,30,17,37,20,25,177,30
185 DATA25,177,30,32,94,30,20,214,40,25,177,30,227227,30,22,227,40,20,214,30
190 DATA25,177,30,22,227,30,17,32,30,19,63,20,21,154,30,22,227,20,21,154,30
200 DATA22,227,30,25,177,30,20,214,30,22,227,30,22,227,30,22,227,200
29999 FORI=0TO1215:READA:POKE205*64+I,A:NEXT
30000 FORI=0TO63:READA:POKE(244*64)+I,A:NEXT
30001 DATA48,0,0,23,48,0,213,204,0,197,0,0,49,67,0,0,80,0,0,20,0
30004 DATA0,166,168,2,254,106,11,218,126,43,214,126,43,214,126,11,218,126,2
30007 DATA254,106,0,166,168,0,20,0,0,80,0,49,64,0,197,3,12,21,48,240,212,0,0,0
30011 DATA0,63,0,0,196,192,0,55,0,0,4,0,0,4,0,0,4,0,0,4,0
30014 DATA0,166,168,2,254,106,11
30015 DATA106,126,43,90,126,43,90
30016 DATA126,11,106,126,2,254,106
30017 DATA0,166,168,0,4,0,0,4,0,0,4,0,0,55,0,0,196,192,0,63,0,0
30021 DATA0,0,192,0,3,5,0,0,21,0,0,20,0,0,83,0,1,76,0,5,0
30024 DATA0,166,168,3,254,106,13
30025 DATA170,126,45,106,126,45,106
30026 DATA126,13,170,126,3,254,106
30027 DATA0,166,168,0,5,12,0,1,112,0,0,83,0,3,20,0,0,213,0,0,5,0
30050 DATA0,0,192,0,3,20,0,0,84,0,0,83,0,1,76,0,5,0,0,20,0,42,154,0,174,191
30060 DATA128,190,171,224,189,167,232,189,167,232,190,171,224,174,191,128,42
30065 DATA154,0,0,20,0,0,5,12,0,1,64,0,12,83,0,3,84,0,0,20,0
30070 DATA0,0,0,252,0,3,19,0,0,220,0,0,16,0,0,16,0,0,16,0,42,154,0,174,191
30080 DATA192,190,170,224,189,169,232,189,169,232,190,170,224,174,191,192
30090 DATA42,154,0,0,16,0,0,16,0,0,16,0,0,220,0,3,19,0,0,252,0,0
31011 DATA12,0,0,80,192,0,87
31012 DATA0,0,20,0,0,197,0
31013 DATA0,49,64,0,0,80,0
31014 DATA42,154,0,174,191,192,190
31015 DATA170,112,189,169,120,189,169
31016 DATA120,190,170,112,174,191,192
31017 DATA42,154,0,0,80,0,49
31018 DATA64,0,197,0,0,20,192
31019 DATA0,87,0,0,80,48,0,0
50001 DATA0,0,0,0,0,0,20,0,0,12,0,24,12,0,140,6,0,112,7,1,224
50003 DATA3,191,192,3,255,200,31,255,236,63,255,255,127,255,255,255,255,236,195
50007 DATA255,200,3,191,192,1,195,128,0
50008 DATA195,0,0,102,0,0,60,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,0,3,0,64,3,0
51003 DATA192,3,128,192,3,129,192,3,131,192,3,255*200,31,255,236,255,255,255
51006 DATA255,255,255,63,255,236,3,255,200,3,191,192,3,131,128,3
51008 DATA129,128,3,1,128,2,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,124,0,0,198
52003 DATA0,1,131,128,3,129,192,131,191,192,227,255,200,255,255,236,127,255
52006 DATA255,63,255,255,31,255,236,3,255,200
52007 DATA7,191,192,15,3,128,28,1,192,48,0,96,64,0,48,0,0,24,0,0,0,0
53001 DATA0,0,0,0,0,0,0
53002 DATA0,0,192,0,0,48,0
53003 DATA0,12,0,0,197,84,0
53004 DATA21,149,64,90,233,84,106
53005 DATA86,149,190,183,218,190,183
53006 DATA218,106,86,149,90,233,84
53007 DATA21,149,64,197,84,0,12
53008 DATA0,0,48,0,0,192,0
53009 DATA0,0,0,0,0,0,0,0
54001 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54003 DATA0,20,0,0,21,80,0
54004 DATA21,86,168,2,175,250,10
54005 DATA189,190,42,189,126,42,189
54006 DATA126,10,189,190,2,175,250
54007 DATA21,86,168,21,80,0,20
54008 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54011 DATA0,51,48,0,12,240,0
54012 DATA243,12,0,12,240,0,51
54013 DATA0,20,12,192,21,83,192
54014 DATA21,87,240,2,173,254,10
54015 DATA189,126,42,189,122,42,189
54016 DATA250,10,191,234,2,175,170
54017 DATA21,86,168,21,80,0,20
54018 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54020 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,40,11,0,10,47
54022 DATA64,62,175,80,14,175,80,14,47,64,14,11,192,58
54024 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54026 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,15
54028 DATA64,2,175,80,2,175,80,2,15,64,14,3,192,10,0,0,40,0,0,0,0
54030 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54032 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,15
54034 DATA64,10,15,80,0,15,80,0,15,64,0,3,192,0
54036 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54101 DATA0,0,0,0,136,192,0,204,0,3,204,48,0,204,0,0,252,12,12,168,0
54104 DATA0,252,3,48,252,16,3,255,200,195,87,195,3,87,0,15,16,48,204,16,0
54107 DATA13,0,0,1,0,192,48
54108 DATA0,0,0,0,0,195,0,0,0,0,0,48,0,0,0,0,0,0,0,136,0,0
54112 DATA204,192,0,204,0,3,204
54113 DATA48,0,252,0,12,168,12
54114 DATA0,252,0,208,252,3,31
54115 DATA252,0,15,87,0,195,87
54116 DATA0,0,19,195,0,16,192
54117 DATA48,1,192,0,1,0,0,0,12,12,0,0,0,0,0,192,0,204,0,0,48,0,0
54201 DATA0,0,0,0,0,0,0
54202 DATA0,0,0,0,0,4,0
54203 DATA16,38,170,154,166,170,152
54204 DATA4,0,16,166,170,152,38
54205 DATA170,154,4,0,16,166,235
54206 DATA154,39,215,216,7,215,208
54207 DATA38,235,154,166,170,154,4
54208 DATA36,30,170,154,166,170,152
54209 DATA44,4,0,0,0,0,0
54301 DATA0,0,129,1,0,134,2
54302 DATA3,0,14,132,0,51,20
54303 DATA4,4,0,4,35,12,9
54304 DATA81,194,50,146,86,66,12
54305 DATA189,140,0,246,16,3,124
54306 DATA17,156,147,90,80,164,132
54307 DATA35,104,132,4,80,72,4
54308 DATA144,232,24,145,48,33,9
54309 DATA0,32,4,128,0,4,0,0
54401 DATA0,0,0,0,0,0,0
54402 DATA0,0,0,0,0,0,0
54403 DATA0,0,0,0,1,128,0
54404 DATA1,128,0,3,224,0,3
54405 DATA240,0,3,216,0,255,255
54406 DATA255,192,252,14,127,255,240
54407 DATA127,255,240,0,0,0,0
54408 DATA0,0,0,0,0,0,0
54409 DATA0,0,0,0,0,0,0,0
55000 FORI=0TO255+128:READA:POKE245*64+I,A:NEXT
55010 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,64,0,1,213,170,151,191
55020 DATA85,126,42,255,235,63,170,189,5,255,244,3,93,208
55030 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
55040 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,0,236,0,0,100
55050 DATA0,2,172,0,2,164,0,0,252,0,0,252,0,0,252,0,0,204,0,0,204,0,0,204,0,0
55060 DATA136,0,0,68,0,0,136,0,2,100,0,0
55070 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,2,236,0,2,164,0
,0
55080 DATA174,0,0,102,0,0,252,0,15,252,0,15,252,0,4,12,0,0,12,0,4,15,0,40,6,0,0,
2
55090 DATA0,0,1,0,0,10,0,0
55100 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,2,252,0,2,116,0,0,174,0,0,166,0
,0
55110 DATA252,0,0,100,0,0,252,0,0,252,0,3,252,0,11,204,0,43,15,0,40,15,128,160,3
55120 DATA160,0,0,160,0,0,32,0,0,160,0
55130 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,0,172,0,0,164,0
,0
55140 DATA100,0,2,164,0,2,252,0,0,252,0,0,252,0,0,204,0,3,207,0,3,207,128,10,3
55150 DATA160,0,0,160,40,0,32,160,0,160,0
55160 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,0,172,0,0,164
55170 DATA0,0,100,0,2,164,0,2,252,0,0,252,0,0,252,0,0,204,0,3,206,120,3,206,120
55180 DATA2,0,120,10,0,120,0,0,0,40,0,0,0
61000 POKE53280,6
62000 FORI=0TO40:READA:POKE49900+I,A:NEXT
62010 DATA234,169,40,133,250,169,4,133,251,162,120,160,0,130,145,250,200,192
62020 DATA40,208,249,232,165,250,24,105,40,133,250,165,251,105,0,133,251
62030 DATA224,152,208,220,96,0
62050 POKE53280,0:POKE53281,11:T=0:POKE56334,PEEK(56334)AND254:POKE1,PEEK(1)AND2
51
62055 FORG=0TO64*8:POKE14336+G,PEEK(53248+G):NEXT:POKE1,PEEK(1)OR4:POKE56334,PEE
K(56334)OR1
62060 READA%:T=T+1:IFA%<>-1THENPOKE14336+G+T,A%:GOTO62060
62065 FORI=0TO60*8STEP8:A=14336+1+I:B=PEEK(A):POKEA,BAND6:NEXT
62070 DATA0,0,0,0,0,0,63,63,120,199,255,124,35,63
62075 DATA192,255,15,240,255,3,255,224,0,195,255,15,243,63,231,0
62080 DATA30,60,255,31,231,255,239,0,136,221,255,255,255,255,255,255
62085 DATA255,255,255,255,255,255,122,34,86,105,253,237,253,117,86,89
62090 DATA255,255,255,255,255,255,255,255
62095 DATA127,255,63,127,31,63,127,255,254,252,248,252,254,255,254,252
62100 DATA27,27,219,216,216,219,195,195,219,219,195,195,27,27,216,216
62105 DATA36,42,20,0,0,20,42,36
62110 DATA63,127,63,255,127,63,93,0,254,255,253,254,253,255,176,136
62115 DATA0,44,190,255,253,254,255,254,34,51,119,63,255,31,63,127
62120 DATA0,12,190,225,127,190,12,0
62125 DATA1,11,7,47,31,191,127,255,255,127,63,95,15,23,3,5
62130 DATA20,62,255,255,255,255,255,255
62135 DATA251,251,0,223,223,0,247,247,242,249,240,49,3,199,231,227
62140 DATA183,183,183,219,221,221,237,237,255,15,240,255,31,231,240,255
62150 DATA-1
62155 FORI=0TO319:READA:POKE251*64+I,A:NEXT
62160 DATA131,255,128,103,255,224,63,224,240,31,192,126,63,128,126,126,192,127
62165 DATA126,32,61,255,0,23,255,0,15,255,0,3,255,0,0,255,14,0,255,7,240,255,19
62170 DATA252,255,97,252,255,192,28,127,128,28,63,192,28,63,255,252,111,255
62175 DATA240,131,255,240,0
62180 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,32,0,48,16,124,96,25,255,192,15
62185 DATA255,128,7,255,192,15,255,192,15,143,192,30,219,192,28,115,192,28,3
62190 DATA190,28,225,204,15,185,240,15,255,240,7,185,240,0,224,224,0
62195 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,32,0,0,112,0,0,168,0,0,248,0,0,248,0,0
62200 DATA112,0,3,254,0,3,254,0,0,112,0,0,240,0,0,250,0,0,252,64,0,249,192,0,127
62205 DATA128,0,255,0,3,150,0,0
62210 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,4,0,0,1,30,16,0,255,160,0,255,192
62215 DATA1,255,224,3,220,240,3,191,112,3,146,112,3,128,112
62220 DATA3,128,48,1,190,48,0,235,160,0,127,192,0,59,128,0,141,0,0
62225 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
62230 DATA7,0,0,111,240,0,63,232,0,30,88,0,31,56,0
62235 DATA29,128,0,62,128,0,62,0,0,127,0,0,156,128,0,20,0,0,0,0,0,0,0,0
62300 FORI=0TO255:READA:POKE49152+I,A:NEXT
62310 DATA162,0,189,0,200,24,105,5,157,0,200,201,240,157,0,200,96
62320 DATA162,0,189,0,200,24,233,5,157,0,200,201,240,157,0,200,96
62330 DATA162,0,189,1,200,24,233,5,157,1,200,201,240,157,1,200,96
62340 DATA162,0,189,1,200,24,105,5,157,1,200,201,240,157,1,200,96
62350 DATA162,0,189,240,7,24,105,1,201,200,144,2,169,205,157,240,7,232,224
62355 DATA1,208,236,96
62360 DATA162,0,189,240,7,24,105,1,201,211,144,2,169,200,157,240,7,232,224
62365 DATA1,208,236,96
62370 DATA162,2,189,0,200,24,105,1,157,0,200,201,240,157,0,200,96
62375 DATA162,4,189,0,200,24,105,2,157,1,200,201,240,157,0,200,96
62380 DATA162,6,189,1,200,24,233,3,157,0,200,201,240,157,1,200,96
62385 DATA162,8,189,1,200,24,105,4,157,1,200,201,240,157,1,200,96
62390 DATA162,11,189,0,200,24,105,1,157,1,200,201,240,157,0,200,96
62395 DATA162,13,189,0,200,24,233,2,157,1,200,201,240,157,0,200,96
62400 DATA162,14,189,1,200,24,233,2,157,0,200,201,240,157,1,200,96
62410 DATA162,2,189,240,7,24,105,1,201,214,144,2,169,211,157,240,7,232
62420 DATA224,8,208,236,96
62500 FORI=0TO9:READA:POKE49500+I,A:NEXT
62510 FORI=0TO30:READA:POKE49520+I,A:NEXT
62520 DATA173,0,220,32,112,193,32,36,194,96
62530 DATA201,126,208,4,32,34,192,96,201,125,208,4,32,51,192,96,201,123,208,7,32
62540 DATA17,192,32,68,192,96,201,119,208,7,32,0,192,32,91,192,96,96
62550 FORI=0TO24:READA:POKE49700+I,A:NEXT
62560 DATA32,114,192,32,131,192,32,148,192,32,165,192,32,182,192,32,199
62570 DATA192,32,216,192,32,233,192,96
63000 POKE198,2:POKE631,13:LOAD

READY.
```

Program Listing Part 2

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0 S1=54276:S2=54277:S3=54273:FORI=S1-4TOS1+20:POKEI,0:NEXT:POKES1+20,15:GOTO6000
0
1 S1=54276:S2=54277:S3=54273:FORI=S1-4TOS1+20:POKEI,0:NEXT:POKES1+20,15
10 A$="█||||||||||||||||||||||||||||||||||||||||":POKE53272,31
15 B$="█_______________________________________"
20 C$="█_______________________________________"
25 D$="█|||||||█|█||||||█|█|||||█|█|||||█|█|||||||█!"
30 E$=" █|"|"|"
35 F$="█   \█|██████████\   \█|██████████\   \█|██████████/   /_█████████"
40 G$="█\██\██\██\██\██\██\██\██\██\██\██\██\██\██\"
50 H$="█   ████████\█|||█|████████\█|||█|████████\█|||█|███████/____/"
100 V=53248:O=205:POKEV+21,255:POKEV+28,3:POKEV+37,10:POKEV+38,14:LI=5:SC=0
120 POKEV+39,1:R=0:DEFFNA(A)=(PEEK(V+30)AND1):DEFFNB(B)=(PEEK(V+31)AND1)
130 FORI=40TO46:POKEV+I,12:NEXT:POKEV+3,100:POKEV+8,100:POKEV+9,200:POKEV+10,150
135 POKEV+11,135:POKEV+27,254:POKEV+29,2:POKEV+40,1:CO=54272
500 A0=49500:POKEV+30,0:POKEV+31,0:GOTO10000
600 FORI=1944TO1983:POKEI,72:POKEI+CO,1:NEXT:FORI=1984TO2023:POKEI,72
610 POKEI+CO,4:NEXT:TL=1983:WL=1984:L=56320:OO=215:IFLI<1THEN23100
999 RETURN
1000 SYSA0:IFFNA(A)=1ORFNB(B)=1THENPOKES1,0:GOTO22000
1010 POKETL,32:POKEWL,72:POKEWL+CO,6:TL=TL-.1:WL=WL+.3:IFPEEK(L)=111THENGOSUB230
00
1012 IFTL<1945ORWL>2022THEN22000
1099 RETURN
10000 POKE53280,2:POKE53281,3:GOSUB13250R=0:LE=1
10005 PRINT"█":PRINTB$;D$;A$;C$;"████████████████";E$;H$;D$;D$:PRINT"█";:PRINTF$
10006 PRINT"████":PRINTG$:PRINT"████":PRINTTAB(31);G$:GOSUB12550:POKEV+21,255
10008 GOSUB600:POKEV+1,170:POKEV,235:POKEV+30,0:POKEV+31,0:R=0:POKE2041,214
10009 GOSUB24000
10010 GOSUB1000:R=R+1:IFR>39THENR=0
10050 IFPEEK(V+1)<45THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO30000
10110 PRINT"██████";TAB(R);E$;"███";:TAB(R);E$;"█████";TAB(R);E$
10199 GOTO10010
11000 PRINT"██████████████████████████":POKE53280,2:POKE53281,3:GOSUB13250
11005 PRINT"█`    ▪||||||||||||||||||||||||||||||||"
11006 PRINT"TTT`      ▪█||||||||||||||||||||||||||||█!"
11007 PRINT"TTT`       ▪█|||||||||||||||||||||||||||█!"
11008 PRINT"TTT`        ▪█||||||||||||||||||||||||||█!"
11009 PRINT"TTT`         ▪█|||||||||||||||||||||||||█!"
11010 PRINT"TTT`          ▪█||||||||||||||||||||||||█!"
11011 PRINT"TTT`           ▪█|||||||||||||||||||||||█!"
11012 PRINT"TTT`            ▪█||||||||||||||||||||||█!"
11013 PRINT"TTT`             ▪█|||||||||||||||||||||█!"
11014 PRINT"TTT`              ▪______________|||||||"
11015 PRINT"TTT`                             ▪█|||||"
11016 PRINT"TTT`                             ▪█||||█!"
11017 PRINT"TTT`                             ▪█||||█!"
11018 PRINT"TTT`   ▪/█        |________/     ▪_█,||||"
11019 PRINT"TTT`   ▪▪█        |█||||||||||█`   ▪▪█|||█!"
11020 PRINT"TTT`   ▪/█       |█|||||||||||█`   ▪▪█|||█!"
11021 PRINT"TTT`   ▪▪█  _   █|█||||||||||█`    ||||||||"
11022 PRINT"TTT`   ▪/█ _ _ █||█||||||||||█`    \█|||||█!"
11023 PRINT"TTT`   ▪▪█_ _ █|█||||||||||||█`    \█|||||█!"
11024 PRINT"TTT`   ▪/ █_ _█|||||||||||||`      \||||||||"
11025 PRINT"TTT_____________█||||||||||||█`     \█|||||█!"
11026 PRINT"TTT█||||||||||||||||||||||||█`     \█|||||█!"
11027 PRINT"TTT█||||||||||||||||||||||||`      \||||||||"
11038 GOSUB600:SYS36864:POKEV,40:POKEV+1,210:POKEV+3,126:POKEV+30,0:POKEV+31,0
11039 POKE2041,222:LE=2:GOSUB24000:GOSUB12550:POKEV+28,3:POKEV+21,255
11040 GOSUB1000
11060 IFPEEK(V+1)<43THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO30000
11099 GOTO11040
11100 POKE53280,2:POKE53281,3:GOSUB13250:LE=3:V=53248:POKEV+28,1:POKEV+21,255
11105 PRINT"█":PRINTD$;D$;A$;C$;"████████████████";D$;A$;D$;D$:POKE2041,223
11106 PRINT"████████████████████";:PRINTF$:PRINT"████████████████████";:POKEV+40,5
11107 PRINTTAB(24);F$:PRINT"████":PRINTG$:PRINT"████":PRINTTAB(31);G$:GOSUB12550
11108 PRINT"█████████";:PRINTTAB(4)H$;"TTTT ";H$;"TTTT ";H$;"TTTT ";H$
11128 GOSUB600:POKEV+1,170:POKEV,235:POKEV+30,0:POKEV+31,0:POKEV+3,155
11139 LE=3:GOSUB24000:GOSUB12550
11140 GOSUB1000
11160 IFPEEK(V+1)<43THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO10000
11199 GOTO11140
11200 POKE53280,4:POKE53281,3:PRINT"██":PRINTC$;
11210 FORT=0TO20:PRINT"█                                  \";:NEXT:PRINTB$
11220 PRINT"████":PRINTTAB(4);H$;TAB(13);H$;TAB(22);H$;TAB(31);H$
11225 PRINT"██":PRINTTAB(31);G$
11230 PRINT"█████████████":PRINTTAB(4);H$;"█";TAB(13);H$;TAB(22);H$;TAB(31);H$
11235 PRINT"█":PRINTTAB(13);H$
11240 PRINT"████████████":PRINTTAB(11);"█_"TAB(20);"█_"TAB(29);"█_"
11245 PRINT"████":PRINTTAB(20);"█_"
11250 PRINT"████████":PRINTTAB(7)"█/L███/███L███/███L███L███/"
11255 POKEV+21,255:PRINT"██████████████████||||||    /"
11268 GOSUB600:SYS36864:POKEV,241:POKEV+1,195:POKEV+3,200:POKEV+30,0:POKEV+31,0
11269 POKE2041,222:LE=4:GOSUB24000:GOSUB12550:POKEV+28,3:POKE2040,205
11280 GOSUB1000
11290 IFPEEK(V+1)<43THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO10000
11299 GOTO11280
12550 PRINT"█";:PRINTTAB(34)SC;:PRINTTAB(74);LI
12555 PRINT"███";:PRINTTAB(34);LE:RETURN
13250 POKE2040,205:FORI=5TO15STEP2:POKEV+I,0:NEXT:POKEV+30,0:POKEV+31,0:RETURN
22000 SYS36864+256
22005 D=217::POKES1,16:POKES2,15:FORJ=5TO25:A=A+1:IFA>8THEND=D+1:POKE2040,D:A=0
22010 FORJJ=5TOJSTEP.5:POKES3,JJ:POKES1,33:NEXTJJ,J:POKEV+27,1:POKES1,0
22015 POKES1,128:POKES2,119
22020 X=PEEK(V):Y=PEEK(V+1):POKEV,X:FORT=YTO250STEP5:FORTT=220TO221:POKE2040,TT
22030 POKES1,128:POKEV+1,T:POKES3,250:POKES1,129:FORA=0TO20
22035 NEXTA,TT,T:POKEV+27,0:LI=LI-1::SYS36864:IFLI<1THENGOSUB23100:GOTO60000
22040 ONLEGOTO10000,11000,11100,11200,30000
23000 IFWL<1985THENRETURN
23005 POKEWL,72:POKEWL+CO,4:OO=OO+1:IFOO>216THENOO=215
23010 WL=WL-1:POKE2040,OO:RETURN
23100 K$="████████████          GAME  OVER":POKEV+21,0:POKE53280,11
23140 POKE53281,11:POKES1,16:POKES1+7,32:POKES1+14,32:POKES2,31:POKES2+7,15
23145 POKES2+14,31:SYS36864+256
23150 FORTT=100TO5STEP-4:POKES3,TT:POKES3+7,TT+10:POKES3+14,TT+20:POKES1,17
23151 POKES1+7,33:POKES1+14,33:PRINTK$:POKE646,INT(RND(1)*15):NEXT
23155 PRINTK$:PRINT"              SCORE ";SC:FORT=0TO2500:NEXT:RETURN
24000 PRINT"██";:PRINTTAB(32)"SC";
24005 PRINT"███";:PRINTTAB(32)"LI";
24010 PRINT"███";:PRINTTAB(32)"LA"
24020 RETURN
30000 POKE53272,31:CH=14336:U=15496:POKE53280,0:O=1024:W=1200:POKE198,0:FF=255
30005 POKE56331,1
30010 V=53248:FORI=0TO7:POKECH+I+W,FF:NEXT:POKE53281,2
30014 PRINT"█": POKE53201,0:SYS49900:FORI=1024TO1200:POKEI+CH,0:NEXT
30020 POKE2040,244:X=20:Y=171:POKEV+21,1:POKEV,X:POKEV+1,Y:POKEV+31,0
30050 PRINTTAB(37)"████▲||":PRINTTAB(37)"█ooo":PRINTTAB(37)"██▲█L"
30055 PRINTTAB(37)"██▲█ █D"TAB(34)"██▲||██▲█ █D":PRINTTAB(34)"█ooo▲█ █D"
30060 PRINTTAB(34)"██▲█||L_█D":PRINTTAB(30)"██▲|||██▲█|██ooo"
30065 PRINTTAB(30)"█oooo▲█|██ooo":PRINTTAB(22)"██▲||||||██▲█||||█ooooo"
30070 PRINTTAB(22)"█ooooooooo▲█|██oooooooo"
30075 PRINTTAB(10)"██▲|||||||||||██▲█|||||||█oo█oo█ooo"
30080 PRINTTAB(10)"█ooooooooooooo▲█|██▲||||█ooo█ooo█ooo"
30085 PRINTTAB(10)"██▲||____||____|█oo▲/|||█oo█oo█oo█ooo"
30090 PRINT"██▲|||||||||██▲█|█ooooo▲|█oooooo▲/_/█ooo██o█oo█ooo"
30095 PRINT"█ooooooooooo▲█oooo█oooo█ooooo█oo█oooo"
30100 PRINT"██▲|______||||█oooooooo█oooooo█oooo█oooo"
30105 PRINT"██▲█ █oooo▲/||█oooooooooooooo██oooooooooooo"
30110 PRINT"██▲██ █oooo▲/█ooooooooooooooooooooooooooo"
30115 PRINT"█oooooooooooooooooooooooooooooooooooooooooo"
30120 PRINT"█ooooooo█ooo█oooooooo▲█oooooooo▲_/"
30122 PRINT"██oooooooooo█oooooooo█ooo█oo█oooooo▲"_/"
30124 PRINT"███ooooooooo█o█o█oo█oooooooo▲||/"
30126 PRINT"████oooo█ooo█oooooooo▲█oo█ooooo▲||||/"
30127 PRINT"████ooooo▲█ooo█oooooo█oo█oooooo▲||||/"
30129 PRINT"█████ooooo▲█oooo█ooooooooo▲||||/"
30130 PRINT"██████ooooo▲█oooo█ooooo█oo█oooo▲||||/"
30132 PRINT"███████ooooo█oo█oooooooo▲_______/"
30134 PRINT"████████ooooo█o█oooooo▲|/"
30136 PRINT"█████████oooo█oooooo▲|/"
30138 PRINT"██████████_____________________█"::IFDD=1THENDD=0:RETURN
30139 POKEV+31,0:Z=0:R=56320
30140 POKEV,X+256*(X>255):POKEV+16,(PEEK(V+16)AND253)OR-(X>255):POKEV+1,Y
30150 POKEU,PP:U=U-.3:Y=Y-.3:POKEV+1,Y:POKEV+31,0:POKEV+30,0:PP=PEEK(R):X=X+2
30155 SC=SC+1:IFPP=123THENX=X+1:Y=Y-.4:U=U-.4
30157 IFPP=119THENX=X+2:Y=Y-.2:U=U-.2
30165 IFPP=126THENY=Y-.7:U=U-.7
30170 IFFNB(B)=1THENPOKEV+16,0:LI=LI-1:ONLEGOTO10000,11000,11100,11200,10000
30175 IFX>330THENPOKEV+16,0:LI=LI+1:ONLEGOTO11000,11100,11200,10000
30199 GOTO30140
60000 POKE53280,11:POKE53281,0:POKE53272,31:SYS37120:POKE53248+21,0:RESTORE
60001 FORI=54272TO54296:POKEI,0:NEXT:POKE54296,15
60005 POKE53265,PEEK(53265)OR16
60010 V=53248:POKEV+21,31:POKEV+23,255:POKEV+29,255:FORI=39TO46:POKEV+I,13:NEXT
60015 POKEV+28,0:OO=250:POKEV+27,0:DD=1:PRINT"█":GOSUB30050
60027 PRINT"██ BY FRANK TOUT !!!HIT SPACE BAR TO PLAY "
60030 X1=75:X2=125:X3=165:X4=205:X5=245:Y1=255
60032 POKEV,X1:POKEV+2,X2:POKEV+4,X3:POKEV+6,X4:POKEV+8,X5
60035 FORI=1TO9STEP2:POKEV+I,Y1:NEXT:FORI=2040TO2044:OO=OO+1:POKEI,OO:NEXT
60040 FORY1=255TO55STEP-1:POKEV+1,Y1:POKEV+3,Y1:POKEV+5,Y1:POKEV+7,Y1:POKEV+9,Y1
60042 NEXTY1:C=000::A=000:B=000
60045 FORI=39TO46:POKEV+I,13:NEXT
60084 GETX$
60085 POKES1+7,16:POKES1,32:POKES1+14,16:POKES2+14,31
60090 POKES2+7,31:POKES2,15:READA,B,C:POKES3+7,A:POKES3+14,B:POKES3,C
60094 POKES1+7,17:POKES1,33:POKES1+14,17:IFC=000THENRESTORE:GOTO60090
60095 FORT=0TO150:NEXT::IFX$=""THEN60084
60096 IFX$=" "THEN60998
60997 GOTO60084
60998 SYS36864:GOSUB63000:CLR:V=53248:POKEV+23,0:POKEV+29,0:RESTORE
60999 FORI=2042TO2047:POKEI,215:NEXT:GOTO1
61005 DATA5,5,10,10,10,5,5,5,10,10,10,5,5,5,10,10,10,5,5,5,10,10,10
61010 DATA5,10,20,20,10,5,5,5,10,20,5,5,10,5,5,5,5,5,10,10,10,20,20,20
61015 DATA10,10,30,10,20,30,10,50,50,10,60,70,10,40,60,10,30,70,10,20,60,10,10,5
61020 DATA20,30,20,30,40,30,40,50,40,60,60,60,50,40,30,40,30,20,30,20,10,20,10,5
61025 DATA20,30,40,20,30,40,20,30,40,40,50,60,40,50,60,40,50,60,30,20,10,20,10,5
61030 DATA20,30,20,30,40,30,40,50,40,60,60,60,50,40,30,40,30,20,30,20,10,20,10,5
61035 DATA10,5
61199 DATA000,000,000
63000 POKE53280,3:POKE53281,3:PRINT"█":POKE53272,31
63010 A1$="█||||||||||||||||||||||||||||||||||||||||"
63015 A2$="██    ▪    ▪    ▪    ▪    ▪    ▪"
63020 A3$="█|||||||||||||||||||||||||||||||"
63025 A4$="██oooooooooooX":A5$="█oo█|█|█|█oo":A6$="█|████ !"
63050 PRINT"█":PRINTTAB(33)"██oooooo":PRINTTAB(32)"██ooooooo"
63055 PRINTTAB(31)"██oooooooo":PRINTTAB(30)"██ooooooooo"
63060 PRINTTAB(29)"██oooooooooo"
63065 PRINTTAB(29);A4$TAB(29);A5$TAB(69);A5$TAB(69)A4$
63070 PRINTTAB(29);A4$TAB(29);A5$TAB(69);A5$TAB(69)A4$
63075 PRINTTAB(7);A3$TAB(8);A2$TAB(48);A2$TAB(47);A3$TAB(48);A2$TAB(88);A2$
63080 FORT=0TO4:PRINTA1$:NEXT:PRINT"TTTTTTTTTTTTT":PRINTTAB(67);A6$
63082 PRINTTAB(7)"█\██\██\"
63084 POKE2040,245:V=53248:POKEV+21,3:POKEV,36:POKEV+1,166:POKEV+28,3
63086 POKEV+37,7:POKEV+38,0:POKEV+39,1:POKEV+23,3:POKEV+29,3:POKEV+27,2
63088 POKE2041,237:POKEV+2,240:POKEV+3,121:POKEV+40,10:X=240
63090 FORT=0TO36:FORZ=246TO250:POKE2041,Z:X=X-1:POKEV+2,X:FORA=0TO20:NEXTA,Z,T
63095 FORY=121TO166:POKEV+3,Y:NEXT
63097 FORX1=36TO2STEP-.2:POKEV,X1:POKEV+2,X1:NEXT:POKEV+23,0:POKEV+29,0:RETURN

READY.
```

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TALES FROM THE CRYPT

Peter Freebrey tries to prevent fellow adventurers from getting lost in pursuit of their goals.

MOSAIC
THE NOMAD OF TIME
THE ADVENTURES OF OSWALD BASTABLE
BOOKWARE

WITH THE RIGHT PIECE OF magical/technological equipment, it is possible to see and hear from afar. The past is clearest, the present can be just a little misty and the future can be decidedly foggy . . . but in an effort to keep you at least partially informed, the scrying glass has been dug out of the cellar and given a quick polish.

Sadly, causing mystical black runes to appear on this piece of specially pulped wood fibre has no magic involved. Technology takes it's toll and by the time you convert this to neural pulses, and translate my apparent gibberish into some form of understandable communication . . . some of our prophesies will already have been proved true (or false!).

PSS get the Midas touch

PSS are introducing the MIDAS adventure concept for the CBM 64 — The MultI Dimensional Animation System. This appears to offer all sorts of exciting facilities, including: 3D graphics, data compression, a form of artificial intelligence, mixed joysticks and keyboard entry and expansion modules for future games. The first adventure using this system will be 'Swords and Sorcery', which appears from PSS releases to be a rather fine example of 'mazes and monsters'. Your character may be developed in traditional style and then progress through further 'Swords and Sorcery' modules . . . . Sounds great — we'll let you know when we see one!

Piecing adventures together

Mosaic Publishing have three adventure games for the '64 about to hit the RAM. 'Erick the Viking' has been written by Level 9 and is a graphics and text adventure based on the children's book by Terry Jones. Screen shots on the packaging look good — so keep your eyes skinned for this one.

Also from Mosaic, but this time programmed by Shards Software are: 'The Stainless Steel Rat Saved The World' and 'Nomad of Time'. Both are based on books by well known sci-fi authors, Harry Harrison and Michael Moorcroft, respectively. Pre-release review copies of these two seemed to be a trifle slow in response time. Final versions may well be improved — watch this column for the low down . . .

Beyond midnight

Beyond Software have finally got to the point of releasing 'Lords of Midnight' (well almost!) for the CBM 64. This program has caused quite a stir since it's introduction for the Spectrum and is eagerly awaited by us 64'ers. 'LOM' crosses the boundaries between an adventure game and a strategy game and by anyone's standards, produces an epic saga. On the Spectrum some 32,000 different views of the landscape are claimed . . . I can't wait!

Talent goes West

Talent Computer Systems is a new software house and amongst its offerings is a mainly text adventure for the 64 (sorry all you other Commodore owners — but thats the way the bytes crumble!). Called 'West' the program is set in and around a ghost town in the Wild West — you J. T. Edson fans had better oil those sixguns and check your poncho's waterproof!

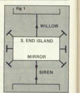
As this will be a regular adventure corner, we hope to foster a certain camaraderie with *you* the reader. If you have any views or news — let us know. We might even be able to HELP. Alternatively it might be just as pleasant to learn that we are semi-mortal and cannot solve *that* problem either.

You are on a mud bank . . .

What next? This is part of the opening sequence that you will find on entering 'Dungeon Adventure' by Level 9. You can of course 'thrash around' every which way, to try and find something — anything! — and generally get the feel of the game. Possibly some of us have to 'get going', move and be damned etc. But, if you are planning to be a true adventurer, sanity must return and out should come pencil and paper as you carefully start at the beginning.

Incidentally, if you do have a quick 'look around' before starting seriously — don't forget to QUIT first — if you do not start from scratch you may find that quick 'look around' has used up some of a predetermined number of moves . . . and the light/sun might go out . . . Or you may develop blisters before finding the bandaids etc.

Fig 1



As you move, study each location description carefully. There may well be red herrings but many of the clues to solving the game will be in what you see and meet (*literally* in the better graphics games!). Sometimes the descriptions will tell you which way you may move — even if this is so, still try *all* directions anyway. Some programs have the phrase 'obvious exits are:' I leave it to your imagination as to what the un-obvious exits may be.

Moving may sometimes prove to be a puzzle in itself! Most adventures will accept a verb and a noun — in that order: GO NORTH — some will accept more complex sentences and many will be quite happy with single letter entries for directions — N,S,E, or W. Find out what your program accepts. Why waste time typing GO NORTH if you can more easily use 'N'.

Simple movement directions are usually no problem — even if you do have to type in GO WEST in full! What can prove baffling is how the programmer has interpreted requests for other seemingly simple actions. Try not to get too frustrated if what you think is obvious was not so to the poor old programmer. Ideally each adventure should recognise all the synonyms for any given word, but memory limitations alone preclude this — just be patient and learn *his* system!

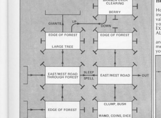
There may be a location hinted at, which appears impossible to reach by using the compass points N, NW,W, SW . . . some programs even require NNE etc! Do not despair, try ENTER 'XXX', or GO 'XXX', or IN 'XXX', or even ENTER, GO or IN. If it's above you try CLIMB, SCALE or ASCEND — you *did* try UP didn't you? I feel that the simple obvious word should be used, as I'm trying to solve the overall puzzle provided by the adventure, not trying to pass an additional test on the English language. I once got caught for ages trying to put my lamp out — otherwise it burnt the basket I was trying to put it in! — OFF LAMP, OUT LAMP . . . finally, and almost at the point of giving up, EXTINGUISH LAMP — ouch! A Thesaurus is a useful book to have on occasions.

Another thing to look for is whether you have to type in the full word — or will the first 4 (or 3 or 5) letters suffice. It may look cryptic but THRO CRUC is much quicker to type than THROW CRUCIFIX!

Be prepared to die or quit fairly often. Partially because, as mentioned earlier, there may be a time/move penalty and also in most games you must learn by trial and error what to do with what, when and where.

Most adventures seem to be split up into quite definite sections. Having solved (you think!) a section, if the program permits, SAVE your game at that point. This seems obvious, but a surprising number of people end up starting from the beginning, repeating dozens of moves only to be killed at the same spot again and again.

Fig 2



One standard puzzle is to find something in section 'B' that is needed in section 'A' to locate something that you must have in section 'C'! Again SAVEing at some point enables you to explore further down the 'chain' to 'suss out' what may be needed back near the beginning. Most programs support the following commands:

INVENTORY/LIST	Displays all the items you are currently holding.
LOOK	Repeats the location description . . . worth trying if you have just 'done' something, you may see an object added to the original description.
HELP	In some games this produces a clue (usually cryptic), in others it repeats a set of instructions, and in still others you just get a rude comment!
EXAMINE/OBSERVE	Very important . . . if in doubt EXAMINE everything. Clues, hidden objects and solutions are the order of the day following this command.
SCORES	Displays current score, either as a number or as a percentage . . . can often give you a clue to whether a particular action or object is important.

MOSAIC
MOSAIC
THE STAINLESS STEEL RAT SAVES THE WORLD
INCLUDES A COPY OF THE BOOK

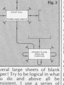
MOSAIC
MOSAIC
THE SAGA OF
ERIK THE VIKING
Adventure game program LEVEL 9
Based on the book by TERRY JONES

A grassy plain to the north . . .

However well you may solve individual puzzles, or find valid clues — they are no use to you unless YOU KNOW EXACTLY WHERE YOU ARE AT ALL TIMES.

Mapping is a personal thing and there are several different methods. Almost every system you use is going to call for several large sheets of blank paper! Try to be logical in what you do and above all be consistent. I use a series of rectangular boxes which may or may not be joined by lines indicating whether there is a connection between the locations.

Fig. 3



Level 9 kindly agreed to me using 'Dungeon Adventure' for the following examples. First how to deal with one particular location (fig 1).

The box represents the location which is the SOUTH END of an ISLAND. On the island may be found a magical MIRROR. The line at the south of this location has two arrows on it, indicating that I can move to and from this location in either direction. 'SIREN' by the side of this line shows a hazard or puzzle that has to be solved before free movement is permitted. 'WILLOW' to the north, with only one arrow indicates another hazard, and as there is an arrow pointing in only one direction — this tells me that I cannot travel in those from the north end of the island! Lines with CROSS BARS at E,W,NE etc show that I cannot travel in those directions.

The two additional directions that you should try are UP and DOWN. I only indicate these if they are accepted. Looking at a slightly larger section of the map we have something like Fig 2.

Leave yourself plenty of room on the paper, so that you can record such things as 'SLEEP WELL' and, if you wish, a brief note on how to overcome the spell! If I find a location where I am moving to another 'section', I usually write a letter in the box and start mapping on a new sheet of paper with the same letter in the location I have just moved to.

Above all be methodical — check every direction. Sometimes you may only travel in one direction from one location to another, so only one arrow will appear on your map (fig 3). Always check to see if you can return to a location by the same path. Fig 3 also shows how I record a path that doubles back on itself to the same location.

So, we have the beginnings of how to approach a new adventure — moving and mapping. Next month we will have a look at one of the adventure programmers favourite tricks — the maze. Again we must map it, but this can prove difficult and calls for a somewhat different technique.

REFERENCE LIBRARY

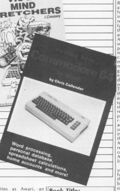
Once again, we have browsed through our Commodore book shelves to bring you this month's literary offerings.

Book Title:
VIC 20 Mind Stretchers
Author:
I. Creasey
Publisher:
Sigma Technical Press
Price:
£5.95

DISGUSTED WITH THE HIGH cost of VIC 20 games filling the shelves of software retail outlets and prepared to spend a little time and effort tapping away at the keyboard? Then fork out the price of one game for this book of 30 'mind-stretchers' from Ian Creasey.

These games seem to have a high destructive element. There are bombs galore in Bomber where your aim is to bomb buildings and land while avoiding the anti-aircraft missiles, Submarine where you have to bomb submarines from a plane and Dumper where you must protect an underground city from the aliens trying to bomb it. If your idea of fun is confrontation with aliens and assorted weirdos, then test your skills at Alien Attack where, while moving to the top of the screen, you must shoot the aliens emerging from the bottom, Munchers where you have to defend the town's dyke from the Munchers and Zombies where you must lure the zombies into the pothole at the centre of the island. Animals also feature with Rhino where you must avoid being eaten by the rhinos while fleeing through the jungle, Cat and Mouse where you must get the mouse out of the maze without being eaten by the cat and Snake where you score points by eating up green numbers (why this obsession with eating?!). Mr. Creasey does produce the odd yawn with such well-worn numbers as Mastermind, Breakout and Connect 4. But the book is also spiced-up with such relative complexities as Awari, an African game of logic and Hammurabi where, having been appointed Hammurabi, you must rule the ancient city of Sumaria for 10 years. An interesting addition is Life, a version of a simulation of the life of cells. The book concludes with a few useful utilities.

Finally, although the introductions to the programs could be described as clear and concise, I failed to discover the 'comprehensive notes' which Mr. Creasey promised would help in 'creating your own programs'.



Book Title:
Mastering the Commododre 64
Author:
A.J. Jones and G.J. Carpenter
Publisher:
Ellis Horwood Limited
Price: £6.95

THIS BOOK AIMS TO provide those readers, already at home with the Commodore 64 and BASIC programming, a deeper understanding of this machine and its capabilities.

The first chapter reviews BASIC — BASIC keywords, arithmetic functions, string functions, logical operators, input/output statements. The reader is then shown how to facilitate BASIC programming through prints, string handling and structured programming. Arrays, binary searches and sorting methods are incorporated into a chapter on data manipulation and BASIC is combined with the 6510 microprocessor in a chapter on memory management. Sound, graphics and sprites are examined in detail before discovering what the 64 has to offer in the way of peripherals. The authors get to the heart of the 64 with a study of its system architecture, the operating system and the kernal. By this stage, the reader should be ready to handle machine code programming — the internal registers of the 6510, addressing modes, interrupts, using an assembler and a full instruction set. An insight into the 6526 Complete Interface Adaptor, the RS232 and the registers of the 6526 chip is contained in the final chapter. Assorted appendices and listings complete the book.

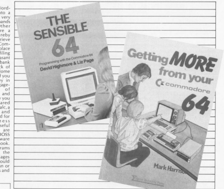
So, if you wish to expand your BASIC knowledge and fully exploit the possibilities of the 64, this meaty guide could be just what the doctor ordered.

Book Title:
Putting Your Commodore 64 to Work
Author:
Chris Callender
Publisher:
Interface Publications
Price: £4.95

THIS SLIM VOLUME OF business applications enables the reader to put the Commodore 64 to work as a business system.

The first program, Wordscreen, turns your 64 into a word processor, albeit a very limited one with 10 commands at your fingertips. Other applications included are a Database package whereby you can store and retrieve information on your Commodore and Cardfile to replace your conventional card filing system. Be spared unpleasant confrontations with your bank manager by keeping track of your spending with Home Accounts and, for those of you with short memories, key in short or long term engagements with Planner of Calendar. Mailing List and Telephone Directory allow you to discard that dog-eared address book and Spreadcalc, a spreadsheet package, and Stock Control are provided for more serious business applications. The most useful programs in the book are chained together with BOSS (Business Orientated Software System) at the end of the book.

Although these programs cannot hope to replace the more comprehensive packages on the market, they should appeal to the business man or woman with limited needs and a low budget.



Book Title:
The Sensible 64
Author:
David Highmore and
Liz Page
Publisher:
Micro Books
Price:
£5.95

THIS BOOK CLAIMS TO offer a less technical overview of the Commodore 64 and its various aspects than that offered by the manuals. It is aimed at experienced programmers and novices alike. Presented in a very plain format and produced in a simple style, it proves that you don't have to depend on glossy pictures and obscure jargon to get your views across.

The authors haven't produced an absolute introduction to the world of the Commodore 64: rather than covering the fundamentals of programming or summarising the capabilities of the 64, they launch into the subject of information input — the GET statement and the various function keys. User-defined graphics and, in a fair amount of detail, sprites are then investigated. The delights of screen rolling, extended colour mode, high resolution bit mapping, X-Y co-ordinates and bit map graphics and joysticks are then examined followed by an insight into sound and music on the Commodore 64. Information on disc drives and the graphic capabilities of printers conclude the book.

To sum up, although not for those readers who don't know one end of a computer from another, this book, sensibly illustrated with diagrams and examples, provides a useful introduction to most aspects of the Commodore 64.

Book Title:
Getting More from your
Commodore 64
Author:
Mark Harrison
Publisher:
Sigma Technical Press
Price: £6.95

ANOTHER BOOK CLAIMING to make some sense out of the Commodore 64 manual. This comprehensive volume takes you from abacuses and Charles Babbage through BASIC programming, high resolution graphics, sound and the relative complexities of machine code on the Commodore 64.

Starting with a brief history of computers, the book leads into a general overview of the Commodore 64. It then guides the reader through programming techniques, Commodore 64 BASIC, the 64 functions, character set and string handling. Computer logic, the 64's memory and character display mode are covered before handling the more intricate high resolution graphics and sprites. Bring your Commodore alive with a chapter on sound and turn your computer into a business system with knowledge of files, data storage and printers. The book concludes with information on data structures and machine code programming, and a list of useful appendices. I found particularly helpful the index to the programs used as examples throughout the book.

There are copious introductions to the Commodore 64 on the market but this one seems to delve deeper into the subject than any of its rivals and should prove invaluable to those readers who feel little the wiser after scouring the 64 manual from cover to cover.

Book Title:
Getting started on your
Commodore/VIC 20
Author:
Tim Hartnell and Mark
Ramshaw
Publisher:
Futura Publications
Price:
£2.95

THE CREDIBILITY OF THIS beginners guide to the VIC 20 lies in that one of the authors is a schoolboy — the category from which a large proportion of its readership is probably drawn. Unlike many so called 'introductions', this jargon-free book really is aimed at the novice: anybody else may find the authors' approach rather condescending.

The book starts where any self-respecting beginners guide should start — with an overview of the VIC's keyboard. It then guides the reader through the basic tenets of programming — screen input, editing and printing. Random numbers, loops and subroutines are explored before venturing into the world of sound and music on the VIC 20. Strings and data are covered before tackling PEEKs, POKEs and arrays. Finally, the reader is shown how to add graphics — user defined, multi-colour and high resolution to his programs. The reader is encouraged to make constructive use of his new-found skills with the sample programs liberally distributed throughout the book.

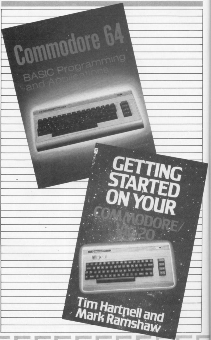
To conclude, although this book won't teach you all you ever wanted to know about programming the VIC 20, it should give you the knowledge and confidence to confront some of the more technical guides available.

Book Title:
Commodore 64 — BASIC Programming and Applications
Author:
Larry Joel Goldstein and Fred Mosher
Publisher:
Prentice/Hall International
Price:
£7.95

THIS BOOK PROVIDES A comprehensive tutorial on programming in BASIC on the Commodore 64. The text is accompanied throughout by programming applications and exercises to test your progress.

The book commences with an introduction to computers and a look at the 64 itself. The authors then take you, step by step, through the BASIC programming language. Each lesson is incorporated into a program and, at each level, you are encouraged to 'Test Your Understanding'. Before adding loops and subroutines to your programs, learning to input data and manipulating strings, and coping with random numbers, the major Commodore peripherals — cassette recorder, disc drive and printer — are assessed. A chapter on filing on the 64 is consolidated with a do-it-yourself Word Processor. You are finally instructed to apply the knowledge thus acquired to creating graphics, designing sprites and adding sound and music to your applications; and try your luck in the games market with a chapter on creating computer games. The book concludes by showing you how to enhance your BASIC programming with Simons' BASIC.

The authors have produced a clear and informative introduction to BASIC programming on the 64, elucidated throughout by appropriate examples and self-test exercises.


Commodore 64
BASIC Programming and Applications
GETTING STARTED ON YOUR COMMODORE/VIC 20
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Chris Palmer takes another look at MIDI and shows you how to set up a system.

MIDI REVISITED

THOSE OF YOU WHO MISSED last month's article must be wondering just what a MIDI is. Well, it's not animal, vegetable or mineral, it is in fact a Musical Instrument Digital Interface. What MIDI enables you to do is to interface various musical instruments (usually keyboards) together. Information from one source can then be passed to another and vice versa.

For many, the most important feature of MIDI is that it also enables you to plug these devices into a computer. This means that your computer can record what you do on any keyboard which is attached and, if you want, play it back on any other keyboard which is attached.

Because a computer is very good at manipulating information of any sort once it is stored in its memory, it is also possible to edit or change the musical information. This is obviously a great boon to both professional and amateur alike, because we all make mistakes.

You don't even have to be able to play a musical instrument to use a MIDI/computer system. The note and timing information for your composition can be entered using the computer keyboard and then played out through a MIDI device attached to the computer, a sort of space-age player-piano if you like.

So, that briefly is what MIDI is. Now let's have a look at how to go about setting up a system.

Setting up a system

For the purpose of this piece we are going to take the Commodore 64 as being the basis for our computer/MIDI system. Why the 64 you might ask? Well for the simple fact that the 64 is one of the most popular computers around at the moment, and therefore a lot of the development of MIDI interfaces and software is done for the 64. So, having agreed that the 64 is the heart of the system, lets consider what we need in the way of a mouth.

When buying an interface of this sort, you have to apply similar criteria to when you buy a computer: chiefly, what software is available. You don't want to land yourself with a system which isn't going to grow with you.

A lot of the companies producing interfaces are themselves producing the sotware to accompany them. This at least means that the software will run alright with the interface, but it does create other problems. Because the software authors are so involved with the design and development of the interface, they often lose sight of the fact that it is the ordinary punter who is going to have to use the thing. Quite a few of the packages which I have seen have been less than friendly in places. More often than not the documentation and examples given in the manuals are misleading as well.

Given that we are a nation of tinkerers, it might also be worth your while finding out how accessible both the software and the interface is to prying programmers. Who knows, you might even be able to sell your creation back to the company. Try and find out what the companies' future software plans are, and whether any other software companies are writing for the interface.

Ins and outs

The purpose of an interface is to pass information from one place to another, so let's have a look at what your interface should have in order to talk to the outside world.

For a start it should have a five-pin DIN socket labelled MIDI OUT. This is essential because, without it, your grand composition will have no way to travel to the keyboard in order to be played. Don't worry if the interface has more than one of these, it just means that the interface can talk directly to more than one keyboard at the same time, without having to resort to the rigours of MIDI THRU.

If you want to be able to send MIDI information to the computer from a musical keyboard, then you will need a MIDI IN. This works in the same way as a MIDI OUT, only backwards. You should only need one of these, because unless you are a closet Rick Wakeman, it is unlikely that you will be using more than one keyboard at a time to program the computer.

Though not essential, another connector you should look for is SYNC or CONTROL. With one of these you will be able to play back any compositions in time with an external source. More often than not this will be a drum machine or rythmn box, which provides a trigger signal out for just this purpose. Unfortunately you can't synchronise with a real drummer, as these will no doubt take exception to having a jack plug rammed up any available orifice.

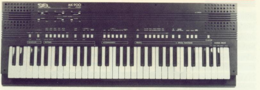
The last connector you might run up against is one labelled MIDI THRU. What this does is provide an exact copy of the information being passed to the interface via the MIDI IN socket. The real advantage of MIDI THRU becomes apparent more on the keyboards than on the interface. Using it you can 'daisy chain' several keyboards together in such a way as there will be no discernable time-lag between you playing a note on the first keyboard and it sounding on the last.

Above all when buying the interface, make sure that it will do what you want and, if possible, have it demonstrated.

Sorting out the software

Carrying on our journey from the heart, via the mouth, we arrive at the brain. Here really is where any system stands or falls, on the quality of the software. It is very difficult to lay any firm guidelines here because everyone has a different idea of what they want to do with a system.

YAMAHA RX15



At the moment MIDI software falls into two categories: composer programs which record, replay and edit musical information which is sent down the MIDI bus from an external keyboard, and those which perform similar functions, but who take their input from the computer keyboard.

The prime consideration for any program is the amount of storage space that is available for the note information. It isn't worth having a program which can drive 16 keyboards, edit any part of the tune and make the tea, if it can only hold ten seconds of music. For a composer program to be any good you need to be able to write more than one part into it, and then have them played back simultaneously. If you are after one of these 'multi-track' packages, then find out the limits of how many tracks you can use, against how much note information can be stored on each track.

If the package does not use a MIDI keyboard as an input device, find out what system you have to use to input the note information. It would be pointless buying a package that uses standard musical notation if you do not know how to read music.

If it is a multitrack package, then find out whether each track can be sent to a different keyboard as one of the big bonuses of a system like this is the ability to write on one keyboard and play back on many. Above all, when you choose the software, have a firm idea of what you want to do already in your mind and then make sure that this is what the package can do.

Choosing a keyboard

Leaving the body now (probably through the nose) we journey into outer space in search of the device which is going to turn our wonderful composition into reality.

Be warned, the synthesiser/keyboard market is nearly as bad as the Hi-Fi market. Walk into any music shop and you will immediately be assaulted by row upon row of shiny keyboards, crammed full of the latest in LEDs, LCDs, VCFs, sliders, benders and triggers. If you ask a shop assistant for some help you will soon realise that the computer industry is not the only place that survives on jargon and buzzwords

For a lot of people the criteria on which a keyboard is bought is purely price. The problem is making sure that you're getting the most of what you want for the price.

Obviously, the prime condition that the keyboard must satisfy is that it must be MIDI compatible. Like the interface, it must have both MIDI IN and MIDI OUT sockets. Find out whether the keyboard can change the MIDI channel it responds to. This is particularly important if you intend to use more than one keyboard with the computer. For instance, if you have two keyboards with the same MIDI number attached to the computer, it will not be able to differentiate between them. This destroys the advantage of being able to play back a piece of music, with different parts being played on different keyboards.

If you are not yet conversant with how a synthesiser works, it would be best to buy one of the MIDI equipped piano/organs which are on the market. If you intend to get into synths as well there are plenty which offer pre-set of pre-programmed voices which will get you going.

Find out what information the keyboard sends out via MIDI. This can range from only the note value and duration, right up to the parameters that make up the sound.

As a rough guide the keyboard should send the following information: the notes which are being played, the position of the pitch bend control (if it has one) and any voice/program changes which occur. With this information coming through MIDI you should be able to record on the computer every aspect of your performance on the keyboard.

It is best to check that the keyboard will work with your computer/interface/software as some combinations will not work, despite the fact that MIDI is supposed to be a standard.

What's around

Hopefully now you will have more of an idea of what you are after when putting together a computer based MIDI system. To help a little further, here are some interfaces, keyboards and drum machines which would be a good place to start yourself off on the road to computer composing.

Interfaces

Sequential Circuits Model 64 Sequencer

This contains all the operating software in ROM and plugs into the expansion port of the 64. It has MIDI IN and OUT along with facilities for syncronising it to an external source. It can be programmed in real-time and offers multitrack recording, editing and auto correction. It has a capacity of upwards of 4000 notes in real time. Proposed software updates include step time input. The price is between £150 and £180.

Siel MIDI Computer Interface

This interface comes supplied with a two way adapter which will fit both the 64 and the Spectrum. It features three MIDI OUTputs, one MIDI IN and a MIDI THRU. It also has a control port for external synchronising. The software is available on disc or tape and at the moment comprises a six track monophonic sequencer where the note information is input from the computer keyboard. Also available is a sixteen track real time sequencer in which each channel can be assigned to a different MIDI device. The price of the interface is around £99.

Keyboards

Korg Poly 800

This is an eight note polyphonic synthesiser with 64 internal memories. The sounds are a little thin sometimes but are on the whole very good. The MIDI channel can be changed and is implemented through a MIDI IN and MIDI OUT socket on the back. The Poly 800 is available also in the form of the EX800 which is a keyboard-less expander unit. Its features are virtually identical to the Poly 800 except that it lacks the keyboard and the bend control. The price for the Poly 800 is between £400 and £450 and the EX800 between £300 and £350.

Siel MK900

This brand new keyboard from Siel features 10 preset sounds of which any two can be split between different places on the keyboard. It also features an inbuilt rythmn unit which can be programmed. The quality of the sounds is quite good considering the price of around £449.

Drum machines

Yamaha RX15

A very good digital drum machine which can actually be played from a keyboard via MIDI. It has the internal memory to store 100 patterns and 10 songs made up of 255 parts. MIDI IN and OUT are provided, making it possible to record and play back patterns using a computer. Price is around £450.

MULTIPLE FILECOPY

When you are stuck with only one disc drive, making your back-up copies can be a long process. Take out the strain by using this program from Grahame Davies.

IF YOU OWN A SINGLE disc drive, you will soon come across the problem of backing the disc up. Even if you own two drives or have access to a twin drive, there is a need for a good, selective back-up procedure. There are several program s available to do this but all of them require several disc changes. In fact, the minimum number of disc changes for backing up an entire 1541 disc is three because the Commodore 64 can hold about 62K of data at a time and a 1541 disc holds about 165K of data.

Another problem with these programs is that they are often difficult, confusing and clumsy to use. The enclosed program goes some way to solving these problems. You will notice that apart from actually reading a file and writing a file, the program is written entirely in BASIC thus making it easy for you to improve on it and add your own extra commands and functions. If you select one of your discs that you require to back-up, you will probably find that you only really need to take a copy of about half the files contained. This will arise due to several reasons: perhaps you alreaady have a copy elsewhere, there may be several versions of a program you are writing on the disc and you only need to take a copy of the latest one and so on.

Drive on

The program will work for a single drive, two drives on different device numbers or for a twin drive. The facility is given to header the disc you are copying onto so you may use a brand new (unformatted) disc. If you have a single drive then you will simply press Return over the first four questions. The directory will be read in and listed to the screen. Displayed will be the file name, the file type and a 'y' against each name to indicate whether to copy the program or not. The program will not copy relative files. You may now cursor up and down the screen and enter 'y' or 'n' against each entry. If you cursor off the top or the bottom of the screen (assuming that there are enough entries) then the display will scroll. If you press 'h' or HOME the cursor will move to the top of the screen. When you have finished, press the 'e' key.

Having pressed 'e', the files to be copied will be listed to the screen with the amount of space taken by each, then the total buffer size and the difference between this and the sum of the programs' size will be printed. The chance to re-edit the list is then given. If there is enough buffer space then the answer to this question is defaulted to 'n'b. If there was not enough space then an error message is printed and the answer to this question is defaulted to 'y'.

The copy will proceed when you are ready and at the relevant time you will be prompted to insert your destination disc. Any disc errors are reported and if a file already exists on the destination disc, the option to overwrite it is given.

Getting lined up

Lines 100 to 140 in the program listing bring down the top of memory (which you will have to reset having run this program), set a pointer to where to put the machine code and also set the buffer start and end points. The buffer is the area that the files from the disc will be stored in. Note that the full capacity of the Commodore 64's memory is not being made use of here. Also note that by changing these pointers, this program will run on any Commodore machine.

Line 150 allows up to 80 files to be read in from a disc which should be more than enough. If it is not enough the program will crash with a bad subscript error and you will have to increase all of the '80's on this line to cater for this.

Next in the program, the machine code is read in from the data statements at the end of the program and POKEd into RAM. This machine code simply reads a complete file (sys p+3) or writes it. (sys p).

Lines 200 to 300 ask for the information about your drives and gives suitable defaults. The directory pattern is the same as when you load a directory from a disc. Thus 'fi★' will return all of the file names starting with 'fi', '★=p' means all program files and so on.

Lines 400 to 599 read in the disc directory. If you look at this closely you will get the idea of how the directory is stored on disc. Line 460 is calculating the file length for instance and lines 490 to 500 get the file name.

Lines 600 to 699 allow the editing of the program names. It is here you could perhaps add another function — maybe one to make the cursor go to the bottom of the screen and then to the bottom of the list.

Lines 700 to 799 list your selected files to the screen and check on buffer size etc. and lines 800 to 2000 actually do the copying. The data at 61000 is for the machine code and lines 63900 onwards save this program to disc keeping one back up copy of it.

Program Listing

```
10 rem *****************************
20 rem *                           *
30 rem *    multiple file copy     *
40 rem *    ==================     *
50 rem *                           *
60 rem *    owen manderfield 3/84  *
70 rem *    grahame davies   7/84  *
80 rem *                           *
90 rem *****************************
100 rem
110 poke53,3*16:clr             :rem   top of mem = $3000
120 p=3*4096                    :rem   code start = $3000
130 bs=3*4096+2*256             :rem buffer start = $3200
140 be=10*4096                  :rem   buffer end = $a000
150 dim fl%(80),f$(80),ft$(80),ff$(80),p1(80),p2(80)
160 p1=p                                    :rem poke up machine code
170 reada:ifa<999thenpokep1,a:p1=p1+1:goto170
200 printchr$(147)chr$(14)"Multiple File Copy Prog."
205 print"by Owen Manderfield":print
210 print"        Source drive   0"
220 print"   Destination drive   0"
230 print"         Source unit   8"
240 print"    Destination unit   8"
250 print"   Directory pattern   *=p"
260 print"New Destination Disk   n"
270 print"    Disk header name   n/a"
300 printchr$(19):print:print
305 rem"<CRSR left * No. > means press left cursor No. times
310 input"        Source drive   0<CRSR left *3>";sd
320 input"   Destination drive   0<CRSR left *3>";dd
330 input"         Source unit   8<CRSR left *3>";su
340 input"    Destination unit   8<CRSR left *3>";du
350 input"   Directory pattern   *=p<CRSR left *5>";dp$
360 input"New Destination Disk   n<CRSR left *3>";n$
365 ifn$<>"y"thenprint:goto380
370 input"    Disk header name   name<CRSR left *6>";h$
380 print:input"Correct   y<CRSR left *3>";a$:ifa$<>"y"then300
390 open14,su,15:open15,du,15
400 print:print:"Reading Source Directory":print"Press SPACE to Stop":print
410 open1,su,0,("$"+right$(str$(sd),1)+":"+dp$)
420 input#14,a,a$,b,c:ifa=0then440
430 close1:print"Directory Error - "a","a$","b","c:end
440 get#1,a$,a$:i=0
450 get#1,a$,b$,c$,d$:ifa$+b$=""then590          :rem end of directory
452 geta$:ifa$=" "then590                         :rem hit space bar to force end
460 fl%(i)=asc(c$+chr$(0))+256*asc(d$+chr$(0))
470 get#1,a$:ifa$=" "ora$=chr$(18)then470        :rem a$ = space or rvs on
480 f$(i)="":ifa$<>chr$(34)thenf$(i)=a$          :rem chr$(34) = quote '"'
490 get#1,a$:ifa$=chr$(34)then510                :rem get file name until quote
495 ifa$=""thenb$="   ":goto530                  :rem   ditto
500 f$(i)=f$(i)+a$:goto490                       :rem   ditto
510 get#1,b$:ifb$=" "then510                     :rem don't want spaces
520 get#1,a$:ifa$<>""thenb$=b$+a$:goto520
530 b$=left$(b$,3):ft$(i)=b$+"y":ifb$="rel"then450
540 a$=right$(str$(i),2)+" "+left$(ff$(i)+"                ",17)
545 a$=a$+left$(ft$(i),3)+" "+right$("    "+str$(fl%(i)*256),5)
550 printa$:ff$(i)=a$
560 i=i+1:goto450
590 close1:nf=i-2
600 printchr$(147);"Select files to copy":print"CUR up/Down Y,N or E":print
601 in=4
602 b=20:ifnf<20thenb=nf
603 a=1:gosub610:goto620
610 forj=atob:printff$(j)tab(31)right$(ft$(j),1):next:return
620 printchr$(19):print:print:fori=1tonf
625 printff$(i)"   "chr$(18)right$(ft$(i),1)chr$(146):rem rvs on and rvs off
630 geta$:ifa$=""then630
640 ifa$<>"y"ora$<>"n"then650
645 ft$(i)=left$(ft$(i),3)+a$:printchr$(145)tab(31)a$:goto690
650 printchr$(145)tab(31)right$(ft$(i),1)
660 ifa$<>"@"anda$<>chr$(145)ori=1then670
662 i=i-2:printchr$(145)chr$(145);:in=in-1:ifin>0ornf<23then695:rem cursor up
664 a=i+1:b=i+24:gosub610:printchr$(19);:in=1:goto695       :rem cursor up
670 ifa$=chr$(37)ora$="e"theni=999:goto690        :rem pressed e to end
675 ifa$=chr$(19)ora$="h"theni=0:printchr$(19);:goto664  :rem pressed h or home
680 ifa$<>chr$(13)anda$<>chr(17)thenprintchr$(145);:i=i-1:goto695:rem illegal key
690 ifi=nfthenprintchr$(145);:i=i-1
692 ifin<24thenin=in+1
695 next:fori=1to10:geta$:next                   :rem clear keyboard buffer
700 printchr$(147)"Files to Copy:-":tf=0:tb=0
710 fori=1tonf:ifright$(ft$(i),1)="n"then750
720 tf=tf+1:tb=tb+256*fl%(i)
730 printright$(str$(tf),2)" "f$(i)tab(25)left$(ft$(i),3);
740 print" "right$("    "+str$(fl%(i)*256),5)
750 next:print:print"Total Files ="tf" , "tb"Bytes"
760 print"Buffer size ="be-bs", Free ="be-bs-tb
770 a$="n":ifbe-bs-tb<0thenprint:print"Buffer Too Full":a$="y"
780 print:print"Re-Edit List   "a$chr$(157)chr$(157)chr$(157);
782 inputa$:ifa$<>"n"then600
785 ifbe-bs-tb<0thenprint:print"Buffer Too Full":goto2000
790 print:print"Procede with copy    y"chr$(157)chr$(157)chr$(157);
795 inputa$:ifa$<>"y"thenend
800 print:print"Reading Files From Source Disk"
810 tf=0:p1=bs:p2=bs
820 fori=1tonf:ifright$(ft$(i),1)<>"y"then890
830 tf=tf+1:print tab(4)f$(i);
835 open1,su,3,(mid$(str$(sd),2)+":"+f$(i)+","+left$(ft$(i),1))
840 input#14,a,a$,b,c:print" - "a$:ifathenclose1:goto2000
850 print"start"p1;:poke641,p1/256:poke640,p1-256*peek(641)
860 rem now load buffer starting at 640,641 note end addr returned in 642,643
870 sys p+3:p2=peek(642)+256*peek(643):print"  End"p2
875 input#14,a,a$,b,c:ifathenprinta$:close1:goto2000
885 p1(i)=p1:p2(i)=p2:p1=p2:close1
890 next
900 ifsd<>dd or su<>duthen940
910 print:print"Place Destination Disk in Drive"
920 input"Is Disk Ready   y<CRSR left *3>";a$
930 ifa$<>"y"then910
940 ifn$<>"y"then1000
1000 print:print"Writing Files to Destination Disk"
1010 p1=bs:p2=bs
1020 fori=1tonf:ifright$(ft$(i),1)<>"y"then1090
1030 tf=tf+1:f1$=","+left$(ft$(i),1)+",w"
1033 printtab(4)f$(i);:open1,du,3,(mid$(str$(dd),2)+":"+f$(i)+f1$)
1040 input#15,a,a$,b,c:printtab(20)a$:ifa=0then1050
1042 close1:ifa<>63then2000
1044 input"File Exists Replace   y<CRSR left *3>";a$:ifa$<>"y"then1090
1046 print#15,"s"+mid$(str$(dd),2)+":"+f$(i):goto1030
1050 p1=p1(i):p2=p2(i):print"start"p1;
1055 poke641,p1/256:poke640,p1-256*peek(641)
1065 poke643,p2/256:poke642,p2-256*peek(643):sys p
1070 sys p                             :rem set start and end address and transmit
1075 print"  End"p2
1080 input#15,a,a$,b,c:printa$:ifathenclose1:goto2000
1090 close1:next
1100 print:print"Copy Finished":end
2000 print:print"COPY ABORTED":end
61000 data 24,144,46,173,128,2,133,98
61010 data 173,129,2,133,99,162,1,32
61020 data 198,255,160,0,32,228,255,145
61030 data 98,230,98,208,2,230,99,165
61040 data 150,240,239,165,98,141,130,2
61050 data 165,99,141,131,2,32,204,255
61060 data 96,173,128,2,133,98,173,129
61070 data 2,133,99,162,1,32,201,255
61080 data 160,0,177,98,32,210,255,230
61090 data 98,208,2,230,99,165,98,205
61100 data 130,2,208,236,165,99,205,131
61110 data 2,208,229,32,204,255,96,170
61120 data 999
63900 open1,8,15:f$="mfc64":print#1,"s0:"+f$+".bak":gosub63960
63920 print#1,"r0:"f$".bak="f$:gosub63960
63940 save("0:"+f$),8:gosub63960:end
63960 get#1,a$:printa$;:ifa$<>chr$(13)then63960
```

SPACE BATTLE

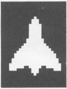
There's nothing like a traditional alien-zapping game to get the adrenalin going! Have fun with this unexpanded VIC 20 game from Andrew Booth.

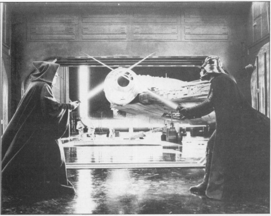
The aim of this game is to shoot as many aliens as possible while dodging the stars. The game is operated with the following keys:

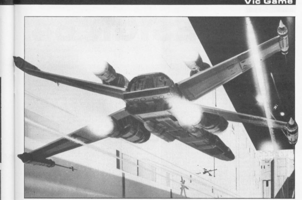
J = Left
K = Right
Z = Fire

Alternatively, you can use a joystick with the fire button to hyperspace.

Line number	Action
3	Prints your score and the number of lives left
6	Draws approaching stars
9	Draws aliens
14-16	Moves your ship
18-22	Reads keypress
23-24	Controls shooting
25-34	Sets screen
35-44	Sets your shooting and goes to instructions
44-54	Instructions
57-60	Starts game
61-66	Gives score plus play another game routine
67-72	You get killed
77-90	More instructions
100-108	Sets data for graphics







Program Listing

```
1 GOTO78
2 GOSUB56:GOTO4
3 PRINT"▮▮C:"$;SPC(5)"LV:";:FORI=1TOLV:PRINT".";:NEXT:POKE214,21:PRINT:RETURN
4 J=1
5 FORI=1TOU
6 POKEB+22*RND(TI),46:NEXT
7 GOSUB3
8 FORI=1TOU
9 I=RND(TI)*20:IFI<U*2THEN30
10 IFU<2THENFORI=1TO50:NEXT
11 POKER,32:PRINT
12 GOSUB3
13 GETA$:J1=PEEK(PA):POKERB,127:J2=PEEK(PB):POKERB,255
14 IF(A$="J"OR(J1AND16)=0)ANDA>7900THENA=A-1
15 IF(A$="K"OR(J2AND128)=0)ANDA<7921THENA=A+1
16 IF(A$=" "OR(J1AND8)=0)THEN18
17 GOTO20
18 IFHV=0ANDHT<2THENHV=1:HT=HT+1:GOTO27
19 IFHV=1THENHV=0
20 IFHV=1THEN27
21 IFPEEK(A)=46THEN68
22 POKEA,59
23 LK=PEEK(A+22):LO=PEEK(A+44):J1=PEEK(PA)
24 IFLO<>32AND(A$="Z"OR(J1AND32)=0)ANDLO<>46ANDLK<>46THEN34
25 IFLK=32THEN27
26 IF(LK=46ORLK=61ORLK=62ORLK=60)THEN68
27 J=J+1:IFJ<200THEN5
28 U=U+1:GOTO4
29 POKEW,0
30 N=B+INT(22*RND(TI)):TM=RND(TI)
31 IFTM>.4THENPOKEN,60:POKEN+30720,6:GOTO11
32 IFTM>.1THENPOKEN,61:POKEN+30720,4:GOTO11
33 POKEN,62:POKEN+30720,5:GOTO11
34 L=A+44
35 IFPEEK(L)=60THENS=S+20:GOTO38
36 IFPEEK(L)=61THENS=S+40:GOTO38
37 IFPEEK(L)=62THENS=S+60:GOTO38
38 POKEL-22,31:POKEL,42:POKEL+30720,1
39 IFFG=0ANDS>=750THENLV=LV+1:FG=1
40 POKEY,15
41 FORI=222TO230STEP2
42 POKEL,30:POKEW,I:POKEL,32:POKEL,30:POKEW,0:NEXT:POKEL-22,32
43 GOTO27
44 PRINT"▮":POKEX,9:PRINTTAB(5)"▮▮INSTRUCTIONS":PRINTTAB(6)"▮▮▮▮  BASE"
45 PRINTTAB(7)"▮:   YOU"
46 PRINTTAB(7)"▮▮<▮   20 PTS"
47 PRINTTAB(7)"▮▮=▮   40 PTS"
48 PRINTTAB(7)"▮▮>▮   60 PTS"
49 PRINT"▮▮SCORE 750 FOR EXTRA :"
50 PRINT"▮YOU CAN GO HYPERSPACE":PRINT"ONLY TWICE"
51 PRINT"▮YOU MUST FIRE AT THE":PRINT"ALIENS 2 SQUARES IN":PRINT"FRONT OF THEM"
52 FORI=1TO10000:NEXT:GOTO2
53 PRINT"▮▮  * * * * *** * * * *"
54 PRINT"▮  *▮  SPACE  BATTLE ▮ *"
55 PRINT"▮  * * * * *** * * * *":RETURN
56 POKE198,0:PRINT"▮":POKEX,14:S=0:LV=3:BN=0:FG=0:A=7911:B=8164
57 FORI=1TO24:PRINT:NEXT
58 GOSUB59:FORI=1TO200:NEXT:RETURN
59 POKEA-23,28:POKEA-22,27:POKEA-21,29:POKE214,18:PRINT:RETURN
60 POKEX,29:GOSUB53
61 PRINT"▮▮▮   YOU SCORED "S
62 IFS>HITHENHI=S
63 PRINT"▮▮▮   HIGH SCORE "HI
64 PRINTTAB(4)"▮▮▮PLAY AGAIN Y/N"
65 GETA$:IFA$=""THEN65
66 IFA$="N"THEN100
67 K3=FRE(0):GOTO1
68 POKEA+30720,4:POKE36877,128
69 FORI=15TO0STEP-1
70 POKEV,I
71 POKEA,30:FORO=1TO50:NEXT:POKEA,42:FORO=1TO50:NEXT:NEXT
72 LV=LV-1:A=7911
73 IFRIGHT$(Z$,2)<>"TS"THEN100
74 POKE36877,0:POKEV,0:POKEX,14:PRINT"▮"
75 IFLV=0THENGOTO60
76 GOSUB59:GOSUB3
77 FORI=1TO900:NEXT:GOTO13
78 POKE36879,217:POKE650,128:Z$="BY ANDREW BOOTH":GOSUB53
79 PRINTTAB(3)"▮▮"Z$
80 PRINTTAB(3)"▮▮USE JOYSTICK OR"
81 PRINTTAB(7)"▮▮J   LEFT"
82 PRINTTAB(7)"▮K   RIGHT"
83 PRINTTAB(7)"▮Z   FIRE"
84 PRINTTAB(3)"▮SPACE   HYPERSPACE"
85 PRINT"▮▮▮   ENTER SKILL 1-6"
86 GETA$:IFA$=""THEN86
87 IFASC(A$)<49ORASC(A$)>54THEN86
88 U=VAL(A$):HT=0
89 PRINTTAB(10)"▮▮"U:D=50:IFRT=1THEN2
90 PRINTTAB(5)"▮▮▮▮PLEASE WAIT"
91 POKE51,255:POKE52,27:POKE55,255:POKE56,27:POKE214,U:CLR:U=PEEK(214):RT=1
92 W=36876:X=36879:V=36878:Z$="BY ANDREW BOOTH":PA=37151:PB=37152:RB=37154:POKEP
A,0
93 FORI=0TO472:POKE7168+I,PEEK(32768+I):NEXT
94 FORI=0TO31
95 READA
96 POKE7641+I,A:NEXT
97 FORI=0TO39:READA:POKE7384+I,A:NEXT
98 POKE36869,255:POKE36866,PEEK(36866)OR128:GOTO44
99 DATA60,24,153,255,153,24,24,0
100 DATA0,24,60,126,255,24,36,66
101 DATA24,60,126,255,219,195,126,66
102 DATA24,60,102,231,255,36,66,36
103 DATA255,255,165,255,255,255,129,0
104 DATA0,1,63,127,213,255,127,63
105 DATA0,128,252,254,171,255,254,252
106 DATA82,8,133,32,4,145,4,82
107 DATA0,4,2,4,0,16,0,4
108 POKE650,0:POKE36869,240:POKE36866,150

READY.
```

Dave Burnett helps Your Commodore readers to design your own characters with the minimum of effort.

DESIGN 64

TYPE IN THE PROGRAM AND save it before running it. Ensure that the DATA in lines 1140-1210 are typed in accurately as this is used in a routine that plays an important part.

This program contains a routine that transfers both character sets into RAM starting at 12288. The BASIC program (well REM'd) occupies RAM from 2049 to 10275. As the operating system uses spare RAM for BASIC Variables etc, the pointer (End of BASIC) has been set by POKING 56 with 65 protecting the program and the Character Data.

The program makes use of the Function Keys (1-8) and also uses the CBM Key in conjunction with the Function Keys giving a total of 12 controls which are displayed on screen, with general instructions (LINES 1300-1710).

When run the program transfers ROM to RAM via the machine code routine (LINES 1130-1210), useful in itself. Characters 0, 254 and 255 (in both POKE sets) are used. All other characters can be changed.

The screen displays the character number (as well as the character) and the start address (in RAM). Having selected the set and the character, keying F5 will display an 8 by 8 grid on the left, an enlarged version of the character and the data making up the character. A second empty grid is then displayed and a new cursor (non-flashing) at top left. This curosr can be moved up, down, left and right (with wraparound control). Stop moving the cursor and press the fire button; the cursor becomes solid. Now moving leaves a trail which can be turned into any shape desired (press fire button again to revert cursor to normal).

When finished designing your first new character, keying F7 will set it to memory and you can see the result (if satisfied); keying F8 will transfer the machine code routine and your new character to tape, provided you have a tape ready (changing this to disc use would be straightforward, see LINES 6000-6240).

Then proceed with your next character etc saving each in turn on the same tape (second and subsequent savings); save only character data. Each character is saved separately (OPENed and CLOSed). When finished, key in CBM and F2 to close save routine.

There is a short program (LINES 9000-9130) which can be copied and run independently which will LOAD the machine code routine and your characters. You can then use your characters within your program and you lose your characters.

If you break out of the program, to try out your characters clear the screen and type GOTO 2030 (which puts you back into the program without losing your characters).

VARIABLES USED

FK — Function Key (PEEK ADDRESS)
FS — Shift Key (PEEK ADDRESS)
JS — Joystick (PEEK ADDRESS) Port 2
GL — Grid Left (SCREEN LOCATION)
GR — Grid Right (SCREEN LOCATION)
C — Colour Value To Add To (PL)
S — Start of Characters in RAM
A — Character Used for Grid (REDESIGNED)
PL — Place (SCREEN LOCATION) for Cursor
CO — Colour Screen
CT(J) — Array for M/C Transfer Data
GC — Grid Colour (SCREEN LOCATION)
NC — New Character Count (SCREEN LOCATION)
NV — New Value Count (POKE VALUE)
NX — Bit Value Count
PA(K) — Poke Address (NEW CHARACTER) Array
CV(K) — Character Value (NEW CHARACTER) Array
CH — Character (PEEK VALUE) Transfer
G2 — Grid (SCREEN LOCATION) Transfer
ZZ — Used for Counting in Save Routine
BC(J) — M/C Data Array in LOAD Routine
BV(J) — Data Value Array in LOAD Routine

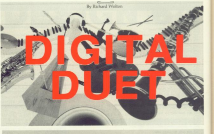
Program Listing

```
100 REM ****   DESIGN 64   ****
101
102 REM **** BY D. BURNETT ****
103
104 REM ****  AUGUST 1984  ****
105
106 REM ****  12166 BYTES  ****
120
121 REM **** VARIABLES USED ****
122
130 POKE53281,0:POKE53280,0:POKE56,65
140 FK=197:FS=653:JS=56320
150 GL=1304:GR=1324:C=54272:CC=1
160 S=12288:A=255:PL=1324:CO=PL+C
170 SR$="■■■■■■■■■■■■■■■■■■■■■■"
180 SS$="
190 DIMCT(58)
1000
1010 REM **** CHARACTERS USED ****
1020
1030 PRINT CHR$(147)
1040
1050 REM CHARACTER (0) SETS 1 AND 2
1060 REM USED FOR GRID.
1070
1080 REM CHARACTER (254 & 255 )
1090 REM SET 1 AND 2  USED AS CURSORS.
1100
1110 REM **** CHARACTER TRANFER DATA ****
1120
1130 FORJ=0TO57:READX:CT(J)=X:POKE49152+J,X:NEXT
1140 DATA120,165,1,41,251,133,1,169
1150 DATA0,133,250,133,252,169,208,133
1160 DATA251,169,48,133,253,160,0
1170 DATA177,250,145,252,200,208
1180 DATA249,230,251,230,253,162,224
1190 DATA228,251,208,239,165,1,9,4,133
1200 DATA1,88,173,24,208,41,240
1210 DATA9,12,141,24,208,96
1220 SYS49152
1230
1231 REM **** GRID CHARACTERS ****
1232
1240 POKE12288,255:FORJ=0TO5:POKE12289+J,129:NEXT:POKE12289+J,255
1250 POKE14336,255:FORJ=0TO5:POKE14337+J,129:NEXT:POKE14337+J,255
1260 P=14320:POKEP,255:POKEP+7,255:POKEP+1,129:POKEP+6,129:POKEP+2,153
1270 POKEP+5,153:POKEP+4,189:POKEP+3,189
1280 P=16376:POKEP,255:POKEP+7,255:POKEP+1,129:POKEP+6,129:POKEP+2,153
1290 POKEP+5,153:POKEP+4,189:POKEP+3,189
1295 FORJ=0TO7:POKE14320+J,255:POKE16368+J,255:NEXT
1300
1301 REM **** INSTRUCTIONS ****
1302
1310 PRINT"■■        CHARACTER DESIGNER■■"
1315 PRINT"NOTE ■■  USE FUNCTION KEY ONLY  ■■■"
1320 PRINT"F1 --- ADVANCE CHARACTER SELECT"
1330 PRINT"F3 --- RETARD CHARACTER SELECT"
1340 PRINT"F5 --- DISPLAY CHARACTER GRID"
1350 PRINT"F7 --- SET REDEFINED CHARACTER■"
1355 PRINT"NOTE ■■  USE SHIFT KEY AND FUNCTION KEY  ■■■"
1360 PRINT"F2 --- SELECT FIRST CHARACTER SET"
1370 PRINT"F4 --- SELECT SECOND CHARACTER SET"
1380 PRINT"F6 --- RETURN TO SELECT MODE"
1390 PRINT"F8 --- SAVE REDIFINED CHARACTER■"
1400 PRINT"NOTE ■■  USE CBM KEY AND FUNCTION KEY  ■■■"
1410 PRINT"■F2■ --- TO CLOSE SAVE ROUTINE"
1420 PRINT"■F4■ --- CLEAR RIGHT GRID"
1430 PRINT"■F6■ --- REVERSE LEFT GRID TO RIGHT"
1440 PRINT"■F8■ --- TRANFER LEFT GRID TO RIGHT■"
1500 PRINT"■PRESS ANY KEY TO CONTINUE..."
1510 GET AN$:IFAN$=""THEN1510
1520 PRINT"■FIRST USE ■F2■ OR ■F4■ TO SELECT CHARACTER"
1530 PRINT"SET.■ THEN USE ■F1■ OR ■F3■ TO SELECT THE"
1540 PRINT"CHARACTER NUMBER.  NEXT USE ■F5■ TO PLACE CHARACTER ONTO GRID.■"
1550 PRINT"USE JOYSTICK (PORT 2): FIREBUTTON WILL  SET OR UNSET,MOVE UP,DOWN,";
1560 PRINT" LEFT OR RIGHT"
1570 PRINT"USE ■ CBM ■ WITH ■F4 F6■ OR ■F8■ TO CLEAR,COPYOR REVERSE";
1580 PRINT" CHARACTER.■":PRINT"USE ■F6■ RETURN TO SELECT MODE OR";
1585 PRINT" IF      FINISHED SET CHARACTER WITH ■F7■■"
1590 PRINT"■F8■ WILL SAVE M/C TRANFER ROUTINE AND NEWCHARACTER DESIGN ON THE";
1600 PRINT" FIRST SAVE AND":PRINT"JUST THE CHARACTER ON OTHER SAVES.■"
1610 PRINT"LEAVE ■RECORD/PLAY■ DOWN UNTIL FINISHED  DESIGNING CHARACTERS"
1620 PRINT"USE ■ CBM ■ WITH ■F2■ TO END SAVE ROUTINE■"
1700 PRINT"■PRESS ANY KEY TO CONTINUE...■"
1710 GET AN$:IFAN$=""THEN1710
2000
```

Program listing

```
2001 REM **** DISPLAY START ****
2002 :
2010 POKE53280,0:POKE53281,0:POKE646,5
2020 PRINT "♥        ▓  CHARACTER  DESIGNER  ▓▓"
2025 :
2026 REM **** F2 KEY PRESS ****
2027 :
2030 IFPEEK(FK)=4ANDPEEK(FS)=1THENCS=142:S=12288:GOSUB 4000
2035 :
2036 REM **** F4 KEY PRESS ****
2037 :
2040 IFPEEK(FK)=5ANDPEEK(FS)=1THENCS=14:S=14336:GOSUB4000
2045 :
2046 REM **** F1 KEY PRESS ****
2047 :
2050 IFPEEK(FK)=4ANDPEEK(FS)=0THENCC=CC+1:IF CC>253THENCC=1
2060 AD=S+CC*8:GOSUB4000
2065 :
2066 REM **** F3 KEY PRESS ****
2067 :
2070 IFPEEK(FK)=5ANDPEEK(FS)=0THENCC=CC-1:IFCC<1THENCC=253
2080 AD=S+CC*8:GOSUB4000
2085 :
2086 REM **** F5 KEY PRESS ****
2087 :
2090 IFPEEK(FK)=6ANDPEEK(FS)=0THEN JR=1:GOSUB4100
2100 :
2101 REM **** F8 KEY PRESS ****
2102 :
2110 IF PEEK(FK)=3 AND PEEK(FS)=1 THEN SR=SR+1:GOSUB 6000
2120 :
2121 REM **** CBM AND F2 KEY PRESS ****
2122 :
2130 IF PEEK(FK)=4 AND PEEK(FS)=2 THEN A=2:GOSUB 6200
2300 IF JR<>1 THEN GOTO 2030
3000 :
3001 REM **** JOYSTICK ROUTINES ****
3002 :
3010 IF PEEK(FK)=3 AND PEEK(FS)=2 THEN GOSUB 5000
3020 IF PEEK(FK)=6 AND PEEK(FS)=2 THEN GOSUB 5400
3030 IF PEEK(FK)=5 AND PEEK(FS)=2 THEN GOSUB 5600
3040 IF PEEK(FK)=6 AND PEEK(FS)=1 THEN JR=0
3200 :
3201 REM **** SET/UNSET ****
3202 :
3210 IF PEEK(JS)=111 AND PEEK(PL)=254 THENA=255
3220 IF PEEK(JS)=111 AND PEEK(PL)=255 THEN A=254
3300 :
3301 REM **** MOVE UP ****
3302 :
3310 IF PEEK(JS)=126 AND PEEK(PL-40)<>32 THEN TV=PL:PL=PL-40:CO=PL+C:GOTO 3340
3320 IF PEEK(JS)=126 AND PEEK(PL-40)=32 THEN TV=PL:PL=PL+280:CO=PL+C
3330 :
3340 IF PEEK(TV)=255 THEN POKETV,0:POKETV+C,12
3400 :
3401 REM **** MOVE DOWN ****
3402 :
3410 IF PEEK(JS)=125 AND PEEK(PL+40)<>32 THEN TV=PL:PL=PL+40:CO=PL+C:GOTO 3430
3420 IF PEEK(JS)=125 AND PEEK(PL+40)=32 THEN TV=PL:PL=PL-280:CO=PL+C
3430 IF PEEK(TV)=255 THEN POKETV,0:POKETV+C,12
3500 :
3501 REM **** MOVE LEFT ****
3502 :
3510 IF PEEK(JS)=123 AND PEEK(PL-1)<>32 THEN TV=PL:PL=PL-1:CO=PL+C:GOTO 3530
3520 IF PEEK(JS)=123 AND PEEK(PL-1)=32 THEN TV=PL:PL=PL+7:CO=PL+C
3530 IF PEEK(TV)=255 THEN POKETV,0:POKETV+54272,12
3600 :
3601 REM **** MOVE RIGHT ****
3602 :
3610 IF PEEK(JS)=119 AND PEEK(PL+1)<>32 THEN TV=PL:PL=PL+1:CO=PL+C:GOTO 3630
3620 IF PEEK(JS)=119 AND PEEK(PL+1)=32 THEN TV=PL:PL=PL-7:CO=PL+C
3630 IF PEEK(TV)=255 THEN POKETV,0:POKETV+54272,12
3700 :
3701 REM **** DESIGNING CHARACTER ****
3702 :
3710 GOSUB 4500
3800 :
3801 REM **** F7 KEY PRESS ****
3802 :
3810 IF PEEK(FK)=3 AND PEEK(FS)=0 THEN JR=0:GOSUB 4600
3998 IF JR<>1 THEN GOTO 2020
3999 IF JR=1 THEN GOTO 3000
4000 :
4001 REM **** SCREEN DISPLAY ****
4002 :
4010 PRINTCHR$(CS):POKE55296,12
4020 PRINT"▓▓▓CHARACTER     ▓▓▓▓▓";
4030 PRINT CC
4040 PRINT"▓▓▓"TAB(24)"ADDRESS";
4050 POKE1120,CC:POKE55392,6
4060 PRINT AD
4070 RETURN
4100 :
4101 REM **** DISPLAY GRID LEFT ****
4102 :
4110 PRINT"▓▓▓▓▓▓1"
4120 PRINT"2631"
4130 PRINT"84268421  DATA"
4140 GL=1304:GC=GL+C
4150 FORK=0TO7
4160 FORJ=0TO7
4170 POKEGL+J,0:POKEGC+J,12
4180 NEXT:GL=GL+40:GC=GC+40:NEXT
4200 :
4201 REM **** CHARACTER ON GRID ****
4202 :
4210 L=0:GL=1304:GC=GL+C:X=128:A$="▓▓▓▓▓▓▓"
4220 FORK=0TO7:X=128
4230 CH=PEEK(AD+K)
4240 FORJ=0TO7
4250 IFCH>=X THENPOKEGL+J+L,254:POKEGC+J+L,11:CH=CH-X
4260 X=X/2
4270 NEXT
4280 L=L+40
4290 NEXT K
4300 :
4301 REM **** CHARACTER VALUES ****
4302 :
4310 FORJ=0TO7
4320 IF PEEK(AD+J)>=0ANDPEEK(AD+J)<=9THENPRINTTAB(10)"  "PEEK(AD+J)
4340 IF PEEK(AD+J)>9ANDPEEK(AD+J)<=99THENPRINTTAB(10)" "PEEK(AD+J)
4350 IF PEEK(AD+J)>99THENPRINTTAB(10)PEEK(AD+J)
4360 NEXT
4400 :
4401 REM **** DISPLAY GRID RIGHT ****
4402 :
4410 GR=1324:GC=GR+C:PL=1324:A=255
4420 FORK=0TO7
4430 FORJ=0TO7
4440 POKEGR+J,0:POKEGC+J,12
4450 NEXT:GR=GR+40:GC=GC+40:NEXT
4470 POKEPL,A:POKEPL+C,1:CO=PL+C
4480 RETURN
4500 POKEPL,A:POKECO,1
4510 PRINT"▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓DATA"
4520 RETURN
4600 :
4601 REM **** DATA FOR RIGHT GRID ****
4602 :
4610 NC=1324:NX=128
4620 FORK=0TO7:FORJ=0TO7
4630 IF PEEK(NC+J)=254 THEN NV=NV+NX
4640 NX=NX/2
4650 NEXT
4660 NC=NC+40:CD=AD+K
4670 :
4680 REM **** DATA PRINT ****
4690 :
4700 IF NV>=0 AND NV<=9 THEN PRINTTAB(30)"  ";NV
4710 IF NV>9 AND NV<=99 THEN PRINTTAB(30)" ";NV
4720 IF NV>99 THEN PRINTTAB(30);NV
4730 CV(K)=NV:PA(K)=CD:NV=0:NX=128:NEXT
4800 :
4801 REM **** ADDRESS AND DATA ****
4802 :
4810 PRINT:FORJ=0TO3
4820 PRINTPA(J);
4830 IF CV(J)>=0 AND CV(J)<=9THENPRINT"  "CV(J)
4840 IF CV(J)>9 AND CV(J)<=99THENPRINT" "CV(J)
4850 IF CV(J)>99 THEN PRINTCV(J)
4860 NEXT:PRINT"TTTTT":FORJ=0TO3
4870 PRINTTAB(20)PA(J+4);
4880 IF CV(J+4)>=0 AND CV(J+4)<=9THENPRINTTAB(20)"  "CV(J+4)
4890 IF CV(J+4)>9 AND CV(J+4)<=99THENPRINTTAB(20)" "CV(J+4)
4900 IF CV(J+4)>99 THEN PRINTTAB(20)CV(J+4)
4910 NEXT
4920 FORJ=0TO7:POKEPA(J),CV(J):NEXT
4998 RETURN
4999 STOP
5000 :
5001 REM **** MOVE TO RIGHT GRID ****
5002 :
5210 L=0:G2=1324:GC=G2+C:X=128:A$="▓▓▓▓▓▓▓"
5220 FORK=0TO7:X=128
5230 CH=PEEK(AD+K)
5240 FORJ=0TO7
5250 IFCH>=X THENPOKEG2+J+L,254:POKEGC+J+L,11:CH=CH-X
5260 X=X/2
5270 NEXT
5280 L=L+40
5290 NEXT K
5300 RETURN
5400 :
5401 REM **** REVERSE TO RIGHT GRID ****
5402 :
5410 L=0:G2=1324:GC=G2+C:X=128:A$="▓▓▓▓▓▓▓"
5420 FORK=0TO7:X=128
5430 CH=255-PEEK(AD+K)
5440 FORJ=0TO7
5450 IFCH>=X THENPOKEG2+J+L,254:POKEGC+J+L,10:CH=CH-X
5460 X=X/2
5470 NEXT
5480 L=L+40
5490 NEXT K
5500 RETURN
5600 :
5601 REM **** CLEAR RIGHT GRID ****
5602 :
5610 GR=1324:GC=GR+C:PL=1324:A=255
5620 FORK=0TO7
5630 FORJ=0TO7
5640 POKEGR+J,0:POKEGC+J,12
5650 NEXT:GR=GR+40:GC=GC+40:NEXT
5670 POKEPL,A:POKEPL+C,1:CO=PL+C
5680 RETURN
6000 :
6001 REM **** SAVE ROUTINE ****
6002 :
6010 PRINT SR$;"TAPE READY TO SAVE ? ANY KEY TO CONTINUE"
6020 POKE198,0:GET NN$:IF NN$="" THEN 6020
6030 PRINTSR$;SS$
6040 IF SR>1 THEN 6100
6050 PRINTSR$;:OPEN 1,1,1,"DATASAVE"
6060 FORJ=0TO57
6070 PRINT#1,CT(J)
6080 PRINTSR$;"SAVING M/C DATA FOR SPEEDY TRANSFER ...."
6090 NEXT
6095 PRINTSR$;SS$:CLOSE1
6100 :
6101 REM **** SAVE CHARACTERS ****
6102 :
6105 ZZ=ZZ+1:CS$="CHARSAVE"+STR$(ZZ)
6110 PRINTSR$:OPEN2,1,1,CS$
6120 PRINTSR$;"SAVING DATA":PRINT#2,PA(0)
6130 FORJ=0TO7
6140 PRINT#2,CV(J):NEXT
6150 PRINTSR$;"FINISHED"
6160 CLOSE2:RETURN
6200 :
6201 REM **** CLOSE ROUTINE ****
6202 :
6205 ZZ=ZZ+1:CS$="CHARSAVE"+STR$(ZZ)
6210 OPEN2,1,2,CS$
6220 PRINTSR$;:PRINT#2,9999:CLOSE2
6230 ZZ=ZZ-1
6240 PRINT"♥";"SAVING COMPLETE ";ZZ;"CHARACTERS SAVED"
6500 :
6501 REM **** LOAD PROGRAM ****
6502 :
6510 PRINT"♥";"SAVING COMPLETE ";ZZ;"CHARACTERS SAVED"
6520 PRINT"USE A PROGRAM LIKE THIS TO LOAD YOUR    CHARACTERS BACK FROM TAPE."
6540 LIST9000-
9000 REM **** LOAD M/C ROUTINE ****
9001 :
9005 DIMBC(57):OPEN1,1,0,"DATASAVE"
9010 FORJ=0TO57
9020 INPUT#1,BC(J):NEXT
9040 CLOSE1
9050 FORJ=0TO57:POKE49152+J,BC(J):NEXT
9060 SYS49152
9065 :
9066 REM **** LOAD CHARACTER ****
9067 :
9070 ZZ=ZZ+1:CS$="CHARSAVE"+STR$(ZZ)
9075 OPEN2,1,0,CS$
9080 INPUT#2,DA:IF DA=9999THEN CLOSE2:END
9090 FORJ=0TO7:INPUT#2,DV(J):NEXT
9115 CLOSE2
9120 FORJ=0TO7:POKEDA+J,DV(J):NEXT
9130 GOTO 9070
```

DIGITAL DUET



By Richard Wolton

Two notable pieces of software face the music in these reviews from David Crisp and Mike Roberts.

MUSICALC (FROM WAVEform for the CBM 64 or SX-64) is one of those programs that you need to use as soon as you get hold of it. The packaging is more reminiscent of a double album than a computer program, but it is stiff card and gives plenty of protection to the disc and manual.

MusiCalc is essentially a program which will enable you to stretch your SID chip to it's limits. It is a synthesiser program which makes my three year old monophonic sythesiser look like a barrel-organ. Waveform obviously realise that most people will want to get music out of their 64 straight away and so, very thoughtfully I feel, the thing that comes to hand after the disc is a small card which shows you how to be totally impressed within minutes. When you load the program the screen displays two numbers: one is the E.T.A. (estimated time of arrival) the other is the C.S.T. (Commodore standard time). The ETA is the time the program should take to load and the CST is the time it actually takes. It does sound frivolous but it is useful. Waveform point out that should the program take longer to load than the ETA shows then it is time to have your Commodore Disc drive doctored.

Creating sound

After a few minutes loading a screen somewhat like the display you see in an Intensive Care Unit appears. A grid on the right shows three 'blips' moving backwards and forward and on the left is a mass of lines, squiggles and dots.

At first I though I would never get the hang of it but the manual is very good and, despite appearances, the display is very logical and easy to use (with practice). As you would expect you are able to control the three voices of the Commodore and at the top left of the screen is a panel for each voice. This enables you to select independently the type of waveform used in sound generation as well as adjusting the ADSR (attack, decay, sustain, release) for each voice. Below this you are able to adjust the width of the pulse wave and manipulate the filtration of the raw sound according to standard sythesiser practice. There are the usual types of filters e.g low, high pass etc, tempo controls and switches to turn on or off particular voices. At first it is a little difficult to see what the oscilliscope like 'trace' on the grid is doing but as you work through the very well written manual the mud clears. Unfortunately I have prior knowledge of things such as how ring modulation and oscillation affects a given sound and so found it difficult to assess whether or not the manual was effective in teaching the 'ground rules' of sound manipulation, but as you can hear exactly what you are doing with the sound as you change it is possible to get what you like without knowing why you have got it. Knowing the theory though would certainly assist in using the synthesiser to the full.

The 'get you going notes' show you some of the built in preset sounds and songs (referred to as scores). A total of thirty two scores and thirty two different 'sets of sound' give a potential combination of hundreds of different variations on a theme. It took me a couple of days to get past the stage of listening only to the demos. The preset sounds go from the most accurate synthesis of fairground pipes playing 'Cruising down the river' to Dr. Who/Craftwork type sounds playing really out of this world scores. Some of the sound

presets I am sure would even have the BBC radiophonic workshop boys drooling. The next step in the manual allows you to play along with any of the preset scores and sounds using any one of the three voices.

Making music

Eventually I decided it was time to let my, as yet unrecognised, and doubtful musical talent loose on the machine. There are two ways to enter music into the machine. First you choose the type of keyboard you require. This can follow the standard chromatic scale as found on pianos etc. or the types favoured by other musical cultures e.g. Hindu, Japanese etc. Choosing different scales means that instead of the usual c,c#, d etc you can have a keyboard that plays a, c#f or almost any combination of the above. Seriously though, if you wanted to do a Ravi Shanker then the keyboard would follow the way the notes follow in music of the Indian culture. A very difficult concept to explain and a difficult one to grasp if you are only familiar with the standard keyboard.

When you have chosen your keyboard you next enter your score. The grid shows each voice following a set pattern across the grid. You can then choose which row of music you wish to enter or edit. When you have the display corresponding to the selected row the screen is split horizontally into two: the top part shows the NOTE you will play and the bottom shows the Octave in which the note will play. Choosing octave 0 effectively plays a rest. Using the function keys you then LAY OUT your tune so that it looks like two bar charts. As you move your BAR up and down you can hear what you are entering so it is easy to correct mistakes. When you finish row one you can then move through the grid one row at a time. It all sounds very difficult but takes only minutes to get used to. After that time it is very easy to use. No knowledge of music is needed to enter the selected score as it can all be done by ear. Using this method of entry it is also easy to copy in standard SHEET music fairly quickly and without too many mistakes.

MusiCalc™
1
Synthesizer & Sequencer
By Richard Wolton

The other way of entering music is to switch into record mode: the notes you play using the qwerty keyboard are remembered. You play one voice at a time and can hear the first voice while playing the second voice and so on. The music you have entered via the keyboard is represented on your ROWS. This can then be edited easily and quickly as described above. A very clever idea and one which makes for easy production of songs. Within minutes I was able to bang out family favourites like ESKIMO NELL.

If you like a set of sounds included in the presets you can use these in your own compositions, equally it is possible to adjust the sounds that the preset scores are played with. It is important to work through the manual as small points can be missed and it is possible to get into all sorts of tangles. My only real critisicisms are the way the keyboard responds. It seems a little slow in response to playing and takes a while to get used to. The other less important one is the relatively small score that can be built up. It is possible to give the impression of a long score by careful repetition but this is not easy. I think that this program has a massive amount of potential not only at home but in the professional field as well. I don't mean that you are likely to see Spandau Ballet using these in their performances but I think that, with the addition of the other modules, groups who cannot read or write music can produce scores eaily and quickly.

Other modules

This leads me on to the other modules which are available. The first one of these will translate your scores into standard sheet music with the aid of a printer. This module also solves the problem of the limited score. It will extend the length of score it is possible to construct without repetition: essential for professional use I would imagine. The third module can be used as a stand alone program but is really intended to be used with the main program. It allows the user to play arpeggios with one key, contains a visual editing mode to allow the user to set up the keyboard into any required arrangement and has many other functions. It would be unfair to make comment on these two modules as I have not seen them but I feel that the quality of them is probably up to the excellent quality of

MusiCalc 1 and so they would be a good buy. It is possible that these two modules may be reviewed in later issues of the magazine.

To sum up the three modules, it is best to borrow Waveform's description: MusiCalc 1 is the instrument, MusiCalc 2 is the keyboard and MusiCalc 3 gives you a hardcopy of your music in standard musical notation. I have just discovered another little extra which is available: a disc containing preset drum rhythms. These would be ideal to base other compositions on and would be great to play along with if you play another instrument. This is an excellent product and a good synthesiser. I did want a Jupiter synth but I don't think I will bother now.

MUSIC MASTER

MUSIC MASTER

MUSIC MASTER BY SUPERsoft claims to make using the SID chip in the Commodore 64 easy. I don't know about easy, but it at least makes it usable.

The SID chip is unquestionably the most advanced music synthesis device in any micro. There is only one problem — to produce a note requires a huge amount of POKEing and bit slicing for each voice. When you can be bothered to work out the masses of computations involved the sound produced can only be described as excellent. Music Master goes some way to helping you to produce music that uses the full facilities of the SID chip.

When the program loads, the main screen shows a piano keyboard representing most of two octaves. Other information around the edge of the screen gives you all the details that you could ever want to know. The most interesting is a small note at the bottom of the screen saying 'press shift-h for help screen'.

Waveforms

Following this advice leads you to three screens that summarise the comprehensive manual. Back to the main screen and you can start to experiment. Pressing keys on the keyboard makes a note sound on all three channels. The way the note sounds can be altered by using the waveform screens or the special effects screen. These screens allow you to manipulate the way the sounds are made to sythesize a piano or flute for instance.

There are 10 preset waveforms that can be used, or you can make up your own. When you have got a sound that you like, Music Master can then create its own program of POKEs to set up the SID chip for you, and dump it to tape or disc. This is a sound for sore ears as this is the biggest problem that the Commodore has.

Entering music

Entering music into the system is quite easy. Tempo (speed of entering music) and the octave that the keyboard is in can be selected and then you're off.

The three channels are displayed on the top of the screen. One of these channels can be manipulated at a time — the edit channel. When the music is entered it can be altered and changed to suit — extra notes added, notes removed, note values changed etc. The whole thing can be played back with speed changes if necessary. There is a limit on the number of notes in a channel, but whether this is 3000 or 1500 I don't know as it is a bit vague.

The sound parameters or all three channels can be saved to tape or disc. One other feature is the backing music. This is the same as those awful Yamaha electric organs that were in fashion some years ago. Channel 2, 3, or both can be used with a list of 17 different backgrounds. You can then play over this. It makes almost total dross sound reasonable. This is not available from edit mode and you cannot store any music using this feature — only play it.

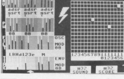
Final note

There are so many things that Music Master can do it is beyond the scope of this review to go into them all in any great detail. I hope I have covered all the main important features.

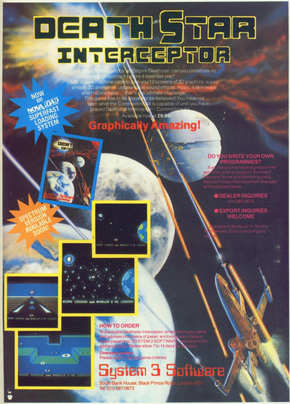
The disc version of the program comes with a large number of demo tunes ranging from 'A string of pearls' (spelt 'A$ of ...'!) to 'When I'm 64'!. Also, the demo programs from the manual are there. I don't know what the tape version contains, but the manual only mentions one tune.

The big problem with the program is that the manual says that it is beyond its scope to explain how to incorporate the data that the program produces into your own programs. After a weekend's work and 2K of machine code later I agree — but it can be done.

There is a program in the book that will play one channel at a time, but it is very unsatisfactory and can be improved 10 fold with the addition of a single line. This said, for the price it is an excellent program. I was very surprised to find that the main body of the program is in BASIC. If you want a music program for the 64 this is the one to get.



DEATH STAR INTERCEPTOR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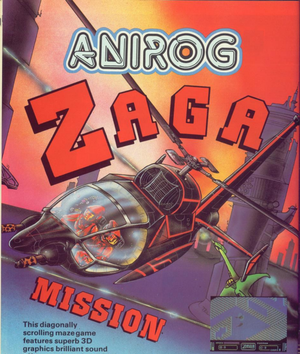

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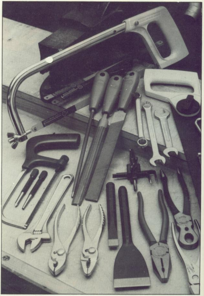
This month, Grahame Davies, Your Commodore's D.I.Y. business enthusiast, looks at formatting numbers and sorting data.

DOING IT YOURSELF



AN IMPORTANT SET OF routines are those which limit variable input to integers, one decimal place, two decimal place etc. and then format these numbers. Apart from the CBM 700, Commodore machines do not have a ROUND function or a PRINT-USING command and so we have to write our own. The advantage of being forced to do this is that we can format our numbers exactly how we like them. For instance you might format the number negative one thousand five hundred and sixty-three in various ways:

```
-1563
-1563.00
(1563.00)
(1 563.00)
(1,563.00)
```

or if you were German:

```
(1.563,00)
```

The BASIC INT command always rounds down thus 1.4, 1.5 and 1.9 will all become 1 if INT is performed on them. We now have to use this limitation to our advantage. The first function to write is a round-off function so that 1.4 = 1, 1.5 = 2 and 1.9 = 2. This is how rounding off is normally performed but if you require different rounding then it is a simple matter of altering the following function:

```
1120 def fnr(z) = int (z + .5)
```

The function we have just defined will now round off to an integer and can be called by a = 1.5 : b = fnr(a). To round off to one decimal place we simply multiply by ten, perform the round off and then divide by ten:

```
1130 def fnr1(z) = int (z ★
10 = .5)/10
```

To round off to two, three etc. decimal places, it is a simple extension of the above function:

```
1140 def fnr2(z) = int(z ★ 100 +
.5)/100
1150 def fnr3(z) = int(z ★ 1000 +
.5)/1000
```

Having done this, we can now set about formatting these variables into strings. The easiest way to do this is to write one general format subroutine for the variable with the most decimal places (we will use and then use smaller subroutines to call this one by simply truncating the string accordingly.

Starting with the general format routine, we will format numbers to two decimal places and return a string of length ten. It is important that the string returned is always the same length so that listings will always be neat. We will also make sure that the routine handles negative numbers.

```
1400 b=fnr2(a):a$=str$(b+.001):ifb=0thena$=".00 "
1410 rem                    there is a space here  ↑
1420 a$=mid$("-  ",sgn(a)+2,1):
                    a$=a$+left$(right$("      "+a$,10),9)
1430 rem        ↑↑↑ minus space space   6 spaces
1440 return
```

This routine allows a floating point number up to 999,999.99 to be formatted. The first character returned is either a space or a minus sign depending on the sign of the number. If zero is returned, the first character is also a space. If you want to change this then change the first string in line 1420 (mid$("- ")) to the symbols you require. This is in the format negative : zero : positive. So if you wanted a minus sign for negative, a plus sign for positive and an asterisk for zero, the string would be "-★+".

To format a string one decimal place, we simply have another subroutine such as:

```
1500 a=fnr1(a):gosub1400:a$=le
ft$(a$,9):return
```

For formatting an integer you could still use the same standard routine:

```
1520 a=fnr(a):gosub1400:a$=lef
t$(a$,7):return
```

Sorting yourself out

The next subject to tackle is the one of sorts. This subject is vast but for out purposes I will explain briefly how a Bubble Sort and a Shell-Metzner Sort work, giving examples of each.

The Bubble Sort is the most simple and most popular sort used by micro-computer owner. The principle is to scan along a set of data held in an array, comparing adjacent elements and swapping them if necessary. If there are N elements in the array then it has to be passed N minus one times to ensure that the sort is complete. If an element is at the wrong end of the array to start with, it is going to be swapped a lot of times before it reaches its sorted position. This is obviously going to be slow. Another problem is that for large arrays, the constant swapping of strings will cause one or more garbage collections thus slowing the sort even more. Each pass of the data will result in one element ending up in its correct sorted position. More than one element may be sorted correctly but we have no way of telling this and so this can be ignored. Each subsequent pass of the array will have to scan along one less element as they become sorted.

The code for the Bubble Sort is therefore very short and convenient for sorting just a few items and here is an example — it sorts N items in A$(array) into ascending order.

Your Commodore will sort numbers faster than strings and it will sort short strings faster than long ones. To make use of this, if you had three hundred records each with one hundred characters of information then you should scan the array taking out the key and putting it into a second array together with a pointer to its original position. Sorting this second array with its shorter records will be much faster and you will end up with a sorted array of keys with pointers to the first array. If you do this, you must remember to keep your keys the same length otherwise the pointer will get merged in and form part of the key.

```
1600 for x = n1 to 1 step -1
1620 for j = 1 to x
1640 if a$(j)   a$(j+1)thent$=a$(j) :a$(j)=a$(j+1):a$(j+1)=t$
1660 next:next
1680 return
```

Example of Bubble Sort

The Shell-Metzner Sort is far faster because it makes swaps of items over greater distances and it also does an "intelligent" Bubble Sort. It does less scans of the data but is more productive on each of these scans. This means that less swaps are made and so the speed increase naturally follows. The "intelligent" Bubble Sort referred to above is more easily explained with an example: if you have an unsorted list such as A C D B E and you do one pass of a bubble sort on it, you will end up with a list looking like this: A C B D E and it will require another pass to get it into a sorted order. The Shell-Metzner sort tries to move back after it has made a swap and then tests to see if further swaps may be made and so on. When it cannot make a swap, it moves forward to continue the rest of the scan. Thus the list will become ordered in only one pass: A C D B E goes to A C B D E (making the first swap the same as the Bubble Sort but then moving back one item to see if B may be swapped again) thus giving A B C D E in only one pass of the data. The information I have provided you with should be enough for you to see why the Shell-Metzner sort is faster although you will have to study it in greater detail to fully appreciate it.

The following example sorts N items into ascending order in A$ array.

Both of these sorts will sort data in situ (not creating new arrays to sort into). If you had enough memory for duplicate array(s) then faster methods are available but the above two should be adequate for most applications.

```
1700 sw=2↑(int(log(n-1)/log(2))+1)
1720 sw=sw/2
1740 p3=n-sw:p2=0:if sw<1 then return
1760 p1=p2
1780 p4=p1+sw:if a$(p1)>a$(p4) then 1840
1800 p2=p2+1:ifp2>p3 then 1720
1820 goto 1760
1840 t$=a$(p1):a$(p1)=a$(p4):a$(p4)=t$
1860 p1=p1-sw:ifp1<0 then 1800
1880 goto 1780
```

Example of Shell-Metzner Sort

David Crisp examines the trials, tribulations and triumphs of a home computer wholesaler in this profile of PCS South West.

COMPUTERS IN BUSINESS

Andy Denning

COVERING SOMERSET, Devon, Cornwall and the Channel Islands PCS SOUTH-WEST have grown from very humble beginnings into one of the major home computer wholesalers in the area. Andy Denning, founder and present chief, started off as a salesman for a well known record company. As the home computer market started to expand he soon saw the potential and need for a distributor in the South West. He had already been selling records to many of the shops that were now beginning to stock home computers and software, so as a known face he had a head start on other salesmen. While calling on a customer he heard that a recently formed distribution company were looking for agents to set up depots throughout the country. Andy left his sales job and within a few weeks he was touring the west country in an estate car selling the latest software at competitive prices.

The car was his warehouse at first with his entire stock loaded into bread baskets. It was only a matter of months before his own house started to fill up. Andy says "I didn't want to get too big too quickly and so my wife and I put up with the house being full of games just in case things went wrong". But nothing did and so he was forced to rent space where he could develop the business and put it on a more permanent footing.

Early days

At about this time the Christmas rush of 83 was just starting. It was necessary for his wife's sister to help run the office while Andy carried on moving around getting into more and more retail outlets and receiving larger and more regular orders.

It has always been his intention to know his product well and so when new software was released he made sure that he tried it himself and could then decide whether or not it was worth stocking. With the rate at which new software is released it is not possible for him now to judge everything personally but everything they stock will be judged by one of his workers and their opinion passed on to Andy. With competition between software houses as it is, software is often advertised on a large scale months before it is released. This obviously means that retail outlets are bombarded with requests for a particular game and in due course Andy is bombarded with orders from the retailers. He has to try and placate the retailer by explaining that despite the adverts the game is not yet available. He feels that he is the cushion between the software house and the customer and has to take a lot of unfair critisicm for not being able to meet demands. "It makes me look as if I am not getting the goods quickly enough and it does reflect on me" he says.

Primarily software

I pointed out to him that in some circles it was felt that computer and games sales had now reached their peak and would now begin a slow decline. His reaction was one of surprise. He said that since he had started there had been a progressive rise in sales and the trend seemed to continue to grow. He said that unlike the skateboard and CB radio, computers could always offer something new, an original game or a new application. Because of this he feels that although the rate of increase ay although the rate of increase may slow down as prices fall and the machines become more powerful there will always be a good market. Unlike many distributors he has not become too deeply involved in stocking the computers themselves. He will supply the hardware but only carries a small stock or gets to order. He says "If you get a bad batch of games it does not mean a massive amount of money has to be found in order to credit the retailer, however ten machines represents a large investment and you only need a few returns in order to make a big dent in the bank account".

Christmas rush

When I was there Andy was preparing for the Christmas rush. Trying to predict which games will be dead and which games will become popular is a nightmare, he says, and that is without any new releases that may appear between now and Christmas. From what I could see while I was there it seemed he had a very good 'nose' for predicting the sellers as when the phone rang he could fulfil almost every order, and many of the unfulfilled orders were due to being out of stock.

I went to see Andy late one afternoon and while talking to him Adam, another of Andy's new recruits, was making up an order for a shop in Exeter. The order had only been received at five o-clock but it was being put together and would be delivered by about six o'clock. This seemed to bear out what Andy had said about trying to get orders to the customer as fast as possible. Adam had started with Andy on a job creation scheme but Andy told me that he would be kept on as a full time employee after the scheme had finished. He said he enjoyed the work and Andy was a good boss who even made the tea! Recent weeks have not been the quiet period that was expected and the new premises taken over only a couple of months ago are already too small. New premises are required already and possibly more staff to cope.

Expansion

By the time you read this Andy will have made great strides towards even more expansion and should be distributing nationwide. He will obviously need more people on the road

to do this but he says whatever happens he will still take a key role and continue to offer fast efficient service, thus enabling Andy to buy software in larger quantities and therefore at a lower price. This should allow him to sell at even more competitive prices and so, with luck, these savings should be passed onto the customer.

Looking around I could see a Spectrum, Commodore 64 and a Dragon and these were being used to evaluate the last batch of new releases. The games were getting a good tryout and two were harshly criticised. "According to the adverts" says Adam "this is supposed to be the best thing since sliced bread. The graphics on the title page are brilliant but the game is a disaster, but due to the massive amounts of money spent on publicity it will sell and I am sure a lot of kids will be disappointed". A large box of tapes, joysticks and discs sat by the office door. Andy told me that they were faulty returns but when they check through he finds that many of them are perfectly OK and presumes that either instructions have not been followed or tapes have been copied then taken back to the retailer as faulty and simply sent back to him as such. "It is one of the costs that I have to absorb" he says. Looking through the box myself I could see what he meant. I could also see that on such things as joysticks many of the returns were due to misuse. It seems that rather than upset retailers Andy will take them back in a lot of cases and simply repair or replace them.

One of the other staff who works in the office is a young girl called Elaine; today she is at college as she also is on a job creation scheme. Andy feels that these schemes are an excellent thing and although they are misused by some on the whole they bring benefits to the people on them and to the employer. Certainly true in Andy's case as all the people on schemes sent to him have now been taken on as full time.

Peripherals

Apart from games Andy's second best seller is joysticks; I saw boxes full of joysticks in all colours, shapes and sizes and, while I was there, almost every order included some joysticks. He tells me that they seem to be the first peripheral bought after the computer. Disc drives come next.

I asked Andy if he wanted to become involved in software writing himself. I was surprised to see that he was in fact marketing an adventure game for the Spectrum under his own label. It was written using the Quill, a piece of software Andy rates highly, and is available for both the Spectrum and Commodore 64. It is called INSANITY and so far it seems to be doing very well. Plans for further releases are not yet known.

Piracy

I asked him if he had seen or been offered any pirate copies of popular games. He immediately responded with an unprintable sentence of what he thought about pirate tapes. He has seen very good copies of popular games at very low prices, but he says they are a recipe for disaster. As the software companies have to put up prices to cover the losses due to pirate copies, sales decline. More copies are made due to the price and so on. It is a vicious circle which cannot be stopped once it gets out of hand. Who is going to spend hours writing and marketing high quality software only to see it ripped off within days of it's release and, in some cases, before it's release? Not only will the prices rocket but the quality of software will drop.

American software

Talking of quality Andy pointed out to me some of the new releases from the USA. They had to be seen to be believed. He feels that this injection of high quality software will force UK writers to think hard and long about the quality of their own goods. Although he is sad for the companies that will obviously 'go under' he feels it is only right that the customer should be able to get the best available for their machine. He is a little worried about the state of the pound of late and says that just as the price of imported software should have been dropped, bang went the exchange rate. This will make price cutting difficult if not impossible and in a few cases may even mean upping the price of imports. He also pointed out to me that over here we are only seeing the best of the American games. He says that over there you can find a lot of very low quality software for sale.

I asked him what he thought about the high hardware prices over here compared with the States. He told me that unfortunately he felt it would always be the same. He says that apart from the exchange rate the sheer volume of sales potential over there means profit margins can be very low. If you can sell a machine or peripheral to just 1% of users over there you are talking about hundreds of thousands of sales. It is the same for everything over there — cars, records the lot. I could see what he meant.

Business sense

Andy is pleased to see home micros being used for other things as well as games. "When I first started it was almost impossible to get any business software for any of the machines and what you could get was not worth having. That has all changed now and some of the business software for the Commodore 64 for instance is infinitely more superior than software that is being run on 'real' business machines", he said.

At the moment Andy is looking to get his business computerised. Andy told me "It is a hard choice. I need a fast and powerful machine and the amount of information I need to store will, without doubt, require a hard disc system. I also need something that will grow with the business as once I get the system set up I don't want to find that it is going to need changing after a few months. I've almost come to a decision on the machine I want. It's now just a matter of getting the right software".

For a non-computerised office everything was incredibly well ordered. Andy said that speed was important to him and that he had to have everythig well organised. This was borne out by the fact that virtually no orders were mislaid and very few orders were late in being delivered. It was this reliability that had helped him succeed where others had failed. "There is no hard sell here. We don't get on the phone all the time asking for orders. People know where we are and they will order from us as long as we do what we do well."

"Our van goes round most of our customers once a week or at worst once a fortnight. The shops are, in most cases, able to take their stock immediately from the van. They can see what they are buying at the time without having to rely on what they have read about it. Of course it is not possible for us to rely on our dealers. Take the Channel Islands for instance, all the business there is done by post or telephone. If a shop is not too far out they can go on our regular route. That way they know when we will be there and that they will find plenty of stock in the van; of course they can still order between visits and we send orders out the same day or the next morning at the latest. In most cases we find that the post gets everything where we want it very quickly but urgent orders can be sent by courier. This means that people often have their orders by the next morning."

Final note

While I was in the office another account was opened with PCS. A customer in Devon was dissatisfied with their present wholesaler and had heard from another dealer that PCS S.W. were fast and reliable. That customer would have the van round to him the next day. Andy tells me that they rarely have to go out and find new business now; their reputation is spreading and most new accounts come through recommendation. To Andy this is a good indication that he is still doing things right and will continue to do it this way, growing bigger and better faster.

More companies than ever before appeared at this year's PCW show. Your Commodore was there to sample their wares.

SHOWDOWN AT OLYMPIA

MICROMANIA HIT THE metropolis on 19th September. For five days a regular army of businessmen and journalists, grandads and eager schoolboys marched through the doors of Olympia 2. Deals were made, joysticks twiddled and books perused. The conglomeration of traders displaying their wares made it all too clear that Christmas starts early in the computer world.

The 7th PCW show had arrived in town. Distributed over three floors of the exhibition centre with the 'big names' on the ground floor, business on the first level and entertainment on the second, this year's exhibition was hailed by the organisers as the 'biggest and best' yet. Showbiz reared its gaudy head with clowns and acrobats, American footballers with cheerleaders in tow, Anirog's P.C. Fuzz on his unicycle and a trio of forlorn tiger cubs. But, under cover of the fun and frivolity, the stage was set for battle (not only on the computer screens!) and eyes were turned to the competition.

Commodore live

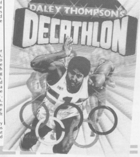
Even overcome by the sheer immensity of the occasion, Commodore fans had no excuse (unless they had made their entrance illicitly through a back window) for bypassing Commodore's latest products. Machines and peripherals, old and new, arose out of a patriotic sea of Commodore red, white and blue. Commodore's four stands, including also the new modem and a mass of software, were strategically placed to the left of the main entrance.

But Commodore obviously face tough competition as illustrated by the vast output from software houses up and down the country.

Sport and spies

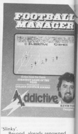
The football season got off to a kicking start with Addictive Games' 'Football Manager' and Argus Press Software's much advertised 'American Football'. Sport was also featured with Ocean's 'Daley Thompson's Decathlon' and Quicksilva's 'Summer Games' based on this Summer's Olympic Games.

Any budding Shoestrings or P.C. Plodds might have been tempted to enter the world of crime fighting as A&F's private eye, 'Gumshoe', Hill MacGibbon's 'Special Agent' or Anirog's 'P.C. Fuzz'. The latter program uses Currah's 'Speech 64', featuring two voices and a text-to-speech system, which was also launched to the public at the PCW show.



Audiogenic and Beyond

Audiogenic were out to prove that big business wasn't all fun and games with their three Commodore 64 business packages for the small businessman — 'Wordcraft 40', 'Magpie' and 'Swift'. They also catered for any aspiring artist with their Koala Pad, a graphics tablet which enables the production of full colour drawings and illustrations directly on the screen. But Audiogenic are still entrenched in the games scene with six recent disc-based games — 'Alice in Videoland' (an adventure based on Lewis Carroll's novel), 'Frantic Freddie', 'Pegasis', 'Forbidden Forest', 'Aztec Challenge' and 'Slinky'.

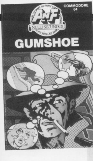


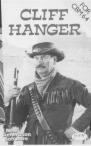
Beyond, already renowned for their best-selling Spectrum games, 'Psytron' and 'The Lords of Midnight', have released a 64 version of 'Psytron', 'Psytron 64', along with 'Ankh', 'Aztec' and 'Mr. Robot'. Also in the offing at the time of going to press were 'My Chess II' and 'Psi-Warrior'.

Bubble Bus and co

Parked on the ground floor, tucked behind the Commodore stands, was Bubble Bus Software. 'Cave Fighter', described as 'an all action jumping, climbing and shooting game', is their latest release for the 64, but Bubble Bus were also showing off other favourites such as 'Bumping Buggies', 'Flying Feathers' and 'Widows Revenge' for the 64 and 'Antimatter Splatter', 'Exterminator' and 'The Catch' for the VIC 20.

Creative Sparks sank from the sublime, with 'Macbeth', to the ridiculous, with 'Danger





COMMODORE 64
HIGHNOON
ocean

Mouse in Double Trouble', based on the popular TV cartoon character. And Microdeal were trying to bury poor old Cuthbert again with their new Commodore 64 game, 'Cuthbert Enters the Tombs of Doom'.

Channel 8 shouldn't have alienated too many of their fans with three new arcade games for the 64. 'Phase 4' and 'Time Zone' follow similar alien-attack themes and, in Channel 8's other space game, as 'Borzak the Amazing Bug-Eyed Beastie from Betelgeuse' falls out of his spaceship into a marsh on earth, you must assist him back to the ship.

Hero time

Action-packed adventure was certainly in the air with Elite's 'Kokotoni Wilf', Melbourne House's 'Zim Sala Bim' and Ocean's 'High Noon'. As Kokotoni Wilf, your aim is to recover all the pieces of the legendary Dragon Amulet whilst dodging the dangers which cross your path. In 'Zim Sala Bim', you move your character through the Arabian desert and, with luck, into the Sultan's seemingly impenetrable palace. And 'High Noon' is a Western Adventure whereby you must keep the peace in a frontier town by shooting the bandits and preventing them from escaping with the girls or gold; it features an aptly named character — Riga Mortis, the undertaker!

Bandits also featured in New Generation's 'Cliff Hanger' in which our hero, Cliff, must stop the evil bandits from shooting up the canyon. It features cartoon-style sequences and humour, based on the popular road-runner series.

Animal magic

Things turned hairy again at Llamasoft with Geoff Minter's latest offering, 'Ancipital'. Mr. Minter describes the Ancipital as 'the harassed-looking little half-man, half-goat creature which scuttles across the planetary surface' in Sheep in Space and the game includes 100 rooms, goats to collect and the villain of the piece, Rory the Vicious Guinea Pig. Quicksilva have also gone animal crackers with their Commodore version of 'Ant Attack'.

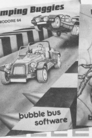
Final offerings

Bikes and cars always lend well to computer games and this show was certainly no exception with Martech's 'The Official Eddie Kidd Jump Challenge', Micro Power's 'Stock Car' and 'Car Journey' from Hill MacGibbon.

Also new from Micro Power came 'Bumble Bee' for the 64. But these had to share the limelight with other Micro Power gems like 'Ghouls', 'Cybertron Mission', 'Felix in the Factory' and 'Swoop'.

Activision, one of the leading lights in 64 software, also exhibited some of their top games for the 64 — 'Pitfall II', 'Beamrider', 'Hero', 'Zenji', 'Toy Bizarre' — as well as their Designer' Pencil which enables you to draw on the screen with a joystick

And there were many more besides — Virgin Games (recent purchasers of the Rabbit brand name and logo) with 'Terrorist' and 'Falcon Patrol 2', a vast array of software from U.S. Gold such as 'Forbidden Forest' and 'Aztec Challenge', and graphics tablets from British Micros (Grafpad) and Touchmaster, as well as shelf upon shelf of books and magazines (although only one of these, of course, was a worthy purchase!)



Widows Revenge
COMMODORE 64
bubble bus software

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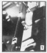
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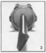
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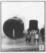
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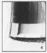
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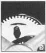
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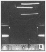
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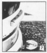
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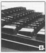
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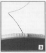
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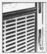
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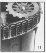
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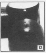
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Just identify the twelve objects pictured opposite....

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and write your (one-word) answers in the spaces provided on the coupon. For instance, if you think that number 9 is a record, write 'record' in the space next to 9 on the coupon and so on. Then tell us in up to 20 words why **MAGAZINES MAKE IDEAL HOLIDAY READING.** Complete the coupon in BLOCK LETTERS, and send it to: *DREAM HOLIDAY COMPETITION, Argus Specialist Publications Ltd., No 1 Golden Square, London W1R 3AB,* to reach us no later than 31st December 1984.

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6 Winners will be notified by post and the results will be published in a future issue of this magazine.

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BEHIND CLOSED DOORS

Simon Palmer unlocks the mind of John Wagstaff, rock star turned programmer, and the brain behind Craig Communications' System 15000.

MID-1983 WITNESSED THE launch of Flight Zero-One-Five, a flight simulator for the unexpanded VIC-20. It contained no graphics but proved that outstanding software could be reproduced in just 3.5K of memory. Since its release it has sold upwards of 16,000, and is still selling.

Its creator was John Wagstaff. A very tall gentleman with long black hair, he started employment at the age of 17 on a fairground with his parents. John then became a musician, receiving gold discs for songs he had written. He earned fame and fortune in Germany (anyone who has ever heard of Lee Kristofferson will realise that Lee and John are one and the same). But he soon discovered that, even though he had 'made it' in Europe to a certain extent, the money did not immediately come pouring in. With cash running low and to stop himself from going mad, John bought a VIC-20 for £200. He taught himself to program and, a year or so later, released Flight Zero-One Five followed by Whirlwind One-Five, which achieved moderate success, and, finally, by his latest baby, System 15000, a communications game.

John Wagstaff — rockstar turned programmer

Craig Communications

The first company to accept John's software and distribute it was N.K.K., where David Giles was already working as the sales-force of this two-man operation. His job was to visit shops and persuade them to buy various titles distributed by N.K.K.. After two months, David's efforts proved so successful that N.K.K. were bought up by a larger concern — Ferranti & Craig, who had been looking for a company to handle distribution. Richard Craig, the final ingredient in the 'mix' spotted N.K.K.

Throughout this change, John Wagstaff's software was still selling and, finally, System 15000 was released. In May 1984, Richard Craig left Ferranti & Craig taking with him David Giles and, inevitably, John's software. A brand new company emerged from this re-shuffle — Craig Communications with David Giles in charge of the software side and Richard Craig responsible for the rest of the organisation. The re-release of all John Wagstaff's software followed swiftly, with a better style presentation for System 15000 and careful attention it had not received under Ferranti & Craig's guidance. The stage was now set for System 15000 to revolutionise adventure games.

System 15000

System 15000 is a new breed of game. Whereas with a normal adventure exercise the game can whish you off to an island or transform you into a detective in hot pursuit of a murderer, System 15000 turns your computer into a computer, the monitor into a monitor and plugs an imaginary modem into the back of the computer, thus introducing you to the B.B.C.'s 'Bird of Prey' type situation. It is such a simple idea yet no-one has thought of it before now.

System 15000 also differs from other adventures in that, since it is a modem simulation game, you can, by dialling a number, return again and again to various computers at any time in the game. It is a genuine real-time communications investigation. For those not familiar with it already, the following synopsis should arouse both interest and enthusiasm.

Your friend's company has been ripped off to the tune of 1,500,000 dollars in a deal it has negotiated. A colleague has contacted you, giving System 15000 and a modem utility and asking you to help get the money back into the swindled company's bank account. He also provides one telephone number, an access code and two names; armed with this information, you open your investigation!

Sitting comfortably opposite John Wagstaff in the pleasant surroundings of his living room, trusty pen poised above paper, I asked him where he found the idea for System 15000.

"It just came to me and, at first, I could not believe it. So obvious, yet after almost endles searching through magazines and the like, I could not find any indications of other people being there first".

How long had it taken him to write it from the initial concept to the finished product? "About nine months of bleeding eyes" was the reply. David Giles appeared and weighed in with: "John wouldn't even tell me what it was until he had completed it ready for playing — and even then he refused to tell me how to proceed. He just said 'play it' ". I must agreee that detailed instructions are very sparse but, according to John, this is totally intentional. With the old-age consideration of value-for-money, I asked whether the price was not a little steep — isn't £12.95 somewhat excessive for a single program? John's reply was quite logical and emphatic.

"People can, and sometimes do, pay in excess of £12.95 for a hard-back book of merit and feel that they are getting good value. The same applies to good software with its underlying creative base, intellectual challenge and complexity. If it gives you a good run for your money, where's the argument?"

I personally do not need any persuasion to this viewpoint, having myself reviewed quite a number of games programs and constantly wishing for more writers of John's calibre and standards. John emphasised that he aimed to produce good quality software rather than higher quantities of less meritorious products. He regards with strong dislike the companies who flood the market with mediocre products, thus devaluing a positive potential for intellectual and, at the same time, entertaining pursuits.

"I owe a great deal to the good people who buy my software — it pays my food bills and stops me from starving. That, after all, is how I got my first computer. I wasn't having much success in getting my money for the records I produced for the German market, and we were literally starving. I am sure that buying that computer did stop me from going mad".

Reminding him of his earlier statement that it took nine months to write System 15000, I asked if he had experienced any problems. He chuckled:

"I have a little saying that every programmer should write out and place above his computer 'THERE'S ALWAYS ONE MORE BUG' ".

I pressed him, and he continued:

"The telephone aspect of the game did present a problem or two; one number which I initiated for the American section of the game turned out to be 'Dial a Blue Joke'! I changed it, but quick! I also had to get permission from the various telecommunication authorities for the use of their different dialling and engaged tones for the U.K. and overseas.

Music and computers

Apart from John's first computer warding off imminent insanity, were there any other reasons for deciding on the purhcase?"

"Yes, I am in the entertainment business and, at the personal level, they are bought mostly for entertainment and have become instruments, both audio and visual for entertainment purposes. Music is after all a form of software, a complex writing sytle embracing almost infinite interpretive functions with both intellectual and entertainment potential. Computers and software can be made to perform the same functions, the only difference being that computers are interactive with the operator".

John, as I have already said, is an accomplished musician. On the wall above where we sit hangs a gold record and, alongside, a gold cassette for 10,000 copies sold of Flight Zero-One-Five presented, ironically enough, by Ferranti & Craig!

Does he see computers making an even bigger impact in the music arena?

"It you think about it computers are already in most of our daily lives, in telephones, drum machines and mixing desks. Synthesised sound is now an established medium ... having moved from an embellishment role such as reluctance to be possessed by musical capabilities of musical instruments, and onward to new and previously unheard-of sound."

John's first encounter with computers was to be in the band's music. He later found that using his own machine was easier to fit on stage as an integral part of their music system. To illustrate the point, he led me into another room and showed me his latest machine which he had set up, no sequential circuits, MIDI interface and software, in which a Pro 808 drum machine and mixing desks. He then gave me a thoroughly interesting run-down on some of the capabilities of this set-up. Impressed I certainly was! All this centered round interest in MIDI systems, for your back issues of *Your Computer* and to read our back issues of MIDI articles.

Other ideas

I asked John whether he thought the CBM was an easy machine to handle by programming? He replied that he thought it was quite a good

machine with much more specialised potential, there is a considerable BASIC that comes with the machine.

Alongside all this music equipment, I could not fail to mention some of the machinery for video editing. When asked whether he had used machines of his own video, he answered that the dream he had got so far was in software and editing was broad.

John asked me whether I had a computer to use on stage and I said before for all sorts of purposes in a variety of settings from simple stage systems and sound. But when I asked if the technology could handle these ideas, he would like to try. "What I'm waiting for is a computer that can handle these ideas," I could not help thinking of the current use of computers in commercial settings of a very broad form of operation, such as the Fairlight used by Geneva.

School chips

Leaving the musical surroundings, we turned David in the lounge. Would John consider writing software for the education market seeing that the coming generation is dealing with computers? No, he would not. He considered computers an ever-increasing need. He never set himself up

then spoke that important knowledge does not have to be learnt by rote. In any case, he thought this could not be achieved in his subject. "The children are the greatest threat to computers these days," John says. He could not allow that machinery to take over the children as a means of learning. I could have suggested there are many instances in which electronic power is put to good effect and is in a more positive guise. However, I realised that any such disagreement would be a likely source of tension in a short time. However, I did not believe that computers were simply a tool. He surrounded these machines, and the unquestioning acceptance of computers, by the younger generation, is but revealing of the enthusiasm and power of this era, that the rest of us cannot catch up. He expanded his point by saying that a new generation can grow up to be able to manipulate and accepting these machines, but this has brought many more potential dangers, with those adults who do not grasp the

"I used to sit with my VIC-20 plugged in with a tall pile of programme cards, and use the 'parrot' software on the other," added John. His patience failed him and in 10,000 copies sold, only about 50 were returned and, of those, about 100 had fault-free customer errors. All of which really demonstrates that the reliability of the software was remarkable, it was around the pulse of the hardware itself within its chart of the day. However, running a top name as it is his reason for being. "Because some people must have the latest hardware produce is an ego trip, but a balance must be maintained with the development and consequences of manufacturers." John smiled when referring to Clive's maybe; his work is so highly individual it does not need a label.

And finally

I asked John about the future. Would there be a sequel to *Whirlwind* or this present variants? "The games are usually like the popular with the age group that take them up, but I think it would be unfair to John, and it is wonderful to give some more technology and I think that things to come will pass to prove to as much variety I believe it has not past.

Reputation

We finally returned to the subject of John Wagstaff and the mysteriousness of what they worry about their reputation? Does, they in fact lose it at all? "I'm sure they don't, and David." "John used to check once in a while on every flight forward and would not put more through it, and I think that things to come will pass

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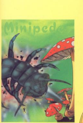

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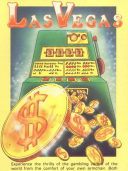

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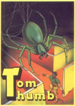

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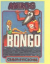
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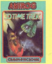
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